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About Authors

● **A. L. Beall** *(M '24) was the Society's vice-president representing the Aircraft-Engine Activity in 1937. This year he represents that Activity on the Membership Committee, is chairman of the Ignition Research Committee, a member of six other SAE technical committees and is the Society's representative on the American Standards Association Sectional Committee for Petroleum Products and Lubricants. Following what he terms a "somewhat unconventional education," Mr. Beall took a job with the Prest-O-Lite Co., where he devoted most of his time to applying the then infant art of acetylene welding to maintenance and production work. After that he spent two years in the development of a single-cylinder air-cooled engine designed for a cycle car; did experimental work on storage batteries for the Westinghouse Union Battery Co., and for some years was in charge of quality control of internal-combustion-engine fuels for the Vacuum Oil Co., and also a member of that company's research committee. He joined Wright Aeronautical in 1933.*

● **A. L. Berger,** *as a direct result of his service in the United States Air Corps during the World War, in 1919 joined the engineering division of the Army Air Corps at McCook Field, Dayton. He participated in the development of the exhaust-turbine-driven supercharger and much of the early work on geared superchargers. More recently his time has been devoted almost entirely toward the solution of problems incidental to this device, including design, alloy development, regulation and operation. As a result of this work the turbine-driven-supercharger has been developed to a point where it is being adapted to all types of aircraft engines.*

● **Opie Chenoweth** *(M '21) vice-president of the Society's Aircraft-Engine Activity in 1936, has been active on technical and administrative committees of the SAE since 1929 when he was chairman of the Dayton Section. While earning his B.S.M.E. at Purdue University Mr. Chenoweth held summer jobs with automotive companies and was research assistant at the Univer-*

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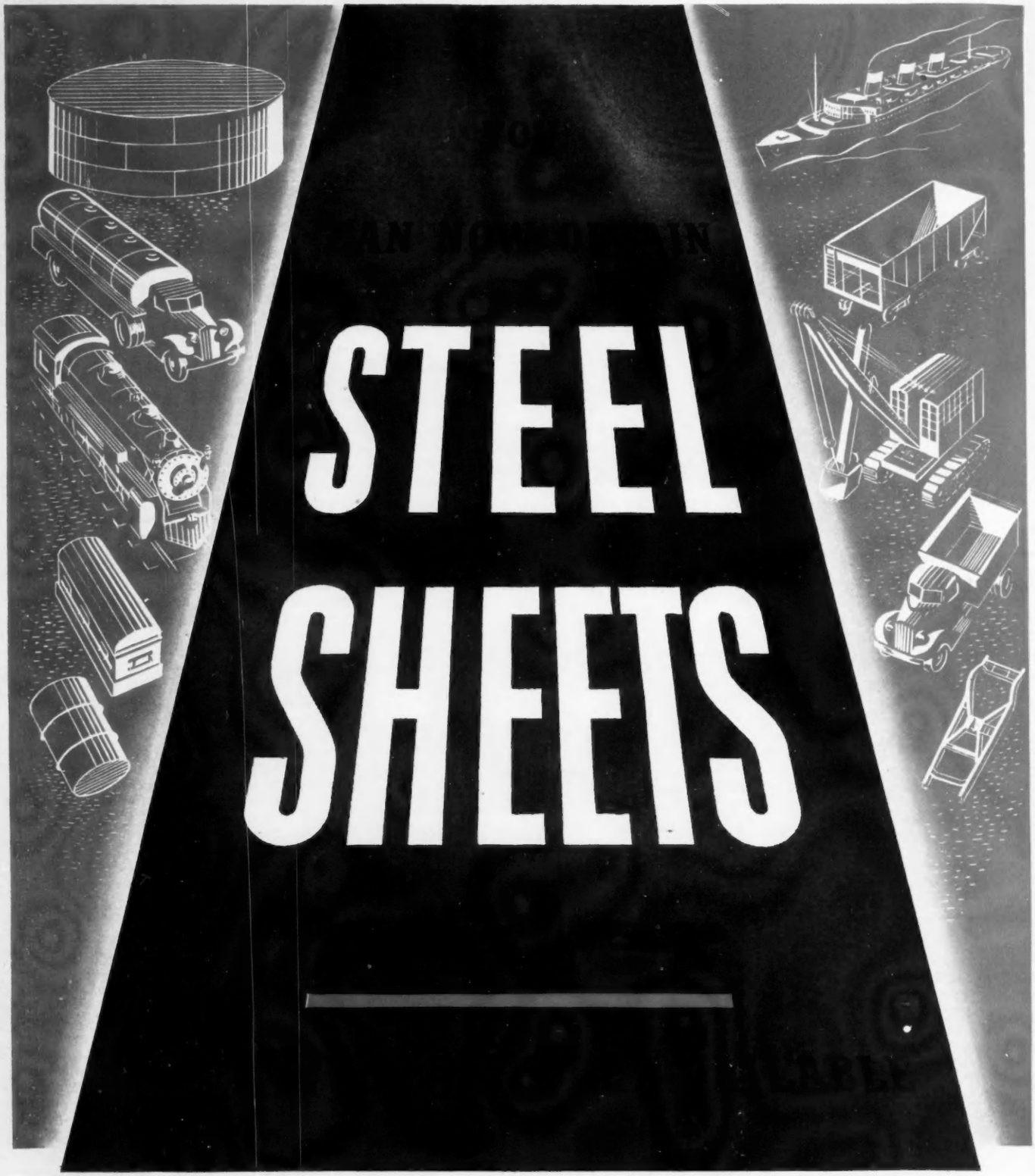

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Trends in Design of 1939 Cars

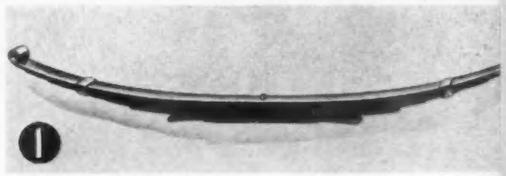
By Austin M. Wolf

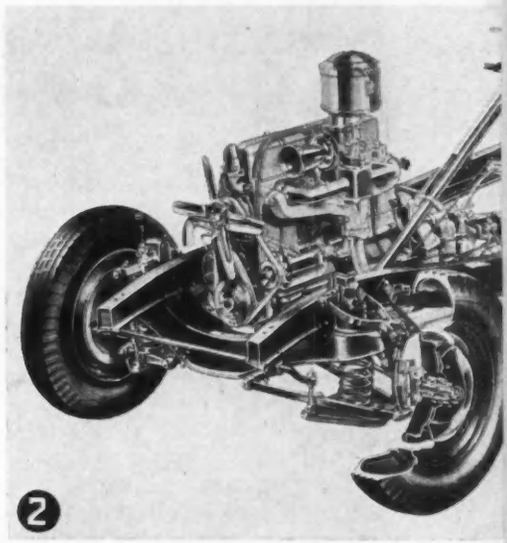
Turn to Page 441

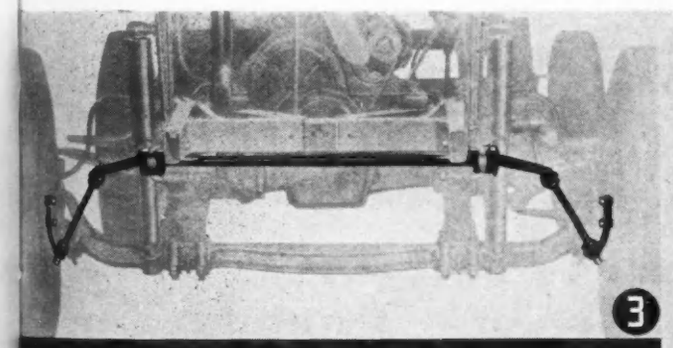
for the complete technical story

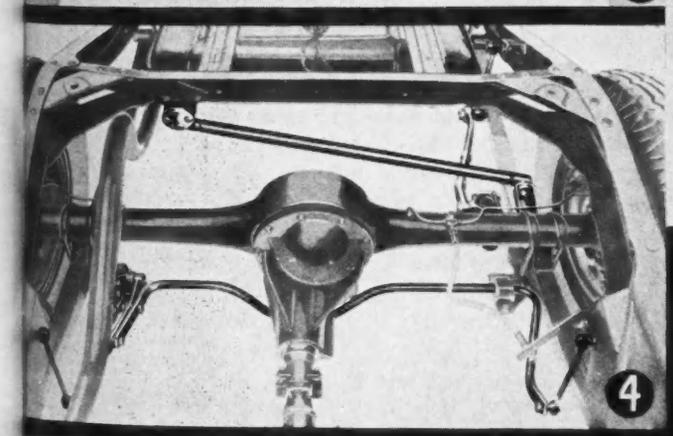
The pictures on this page begin the story

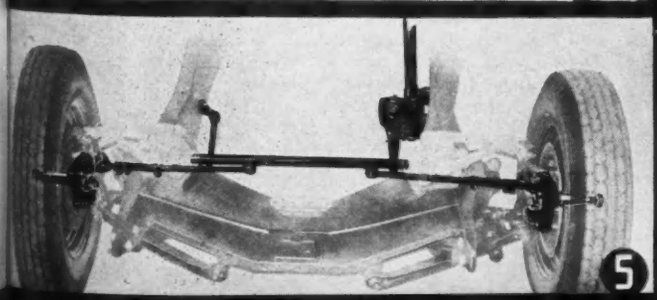
1. Pontiac Variable-Rate Rear Spring
2. Chevrolet Parallel-Link Front Suspension
3. Hudson "Auto-Poise" Control
4. Packard Rear Cross-Link with Shock-Absorber Anchorage
5. Pontiac Cross-Link Steering with Individual Tie-Rods to Each Wheel
6. Dodge "Safety-Light" Speedometer
7. Chevrolet Steering Gear with Rubber-Insulated Pitman Arm
8. Oldsmobile Coil-Spring Suspension and Torque Arms
9. Buick "40" and "60" Torque Ball and Strut Rods

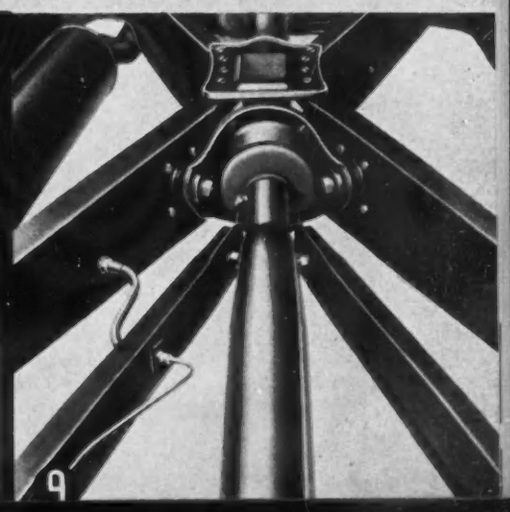












News of the Society

Striking Advances Previewed at Aircraft Production Forum

By Charles F. McReynolds

THE Civil Aeronautics Authority, although happy to inherit the technical competence in the bureaus which have been merged under its aegis, has a weightier task than the one upon which these competent technicians have so effectively worked heretofore, Clinton M. Hester, C. A. A. Administrator, told the 3rd Annual SAE National Aircraft Production Meeting at Los Angeles, when he spoke at the dinner which climaxed the Oct. 13-15 sessions. Some problems are new, but Mr. Hester gave assurance that "the answer to none of aviation's problems will come through curbstone or after-dinner opinions of a mere Administrator." C. A. A. action, he said, will be guided always by the basic mandate to encourage and develop "a system for commerce, mail and defense." Private flying, he added, for the first time is going to be approached in a more rational way.

Total registrations topped 1200; aviation engineers and executives flocking to the meeting in unprecedented numbers.

The aeronautical atmosphere of the sessions was greatly enhanced by the almost continuous drone of commercial airliners, or other aircraft, plying overhead. Figures printed in Los Angeles newspapers during the meeting emphasized not only the lead of the Southern California area in aircraft production, but the large volume which such production has now attained. It was said that during the first six months of 1938 the aircraft factories of Los Angeles County alone produced 25 per cent by number of all aircraft built in the United States, and 50 per cent of all production on the basis of dollar volume. These figures were emphasized further by J. H. Kindelberger in his introductory remarks at the Banquet when he said that the 400 people present were more than had been employed by the entire aviation industry in Los Angeles County when he came out 13 years ago to join the Douglas Aircraft Co. He remarked that, since that time, the industry has grown until it now employs more than 12,000 people in this area alone. Production engineers also were reminded that continuation of present schedules is assured by the current backlogs of unfilled orders, with three factories alone reporting a total business on the books of over $67,000,000.

For those engineers not awed by production figures, and the problems for the engineer which they present, there was plenty of startling information imparted in the sessions proper. Even those in the aviation industry marveled at some of the newer developments, such as the new Profilometer that measures surface roughness in millionths of an inch; the positive altimeter that accurately reports the distance of a plane above the terrain, even to every ridge and gulley; the new radio-controlled landing systems with which planes can be landed without the aid of the pilot; the pressurized plane cabins that permit passengers to travel in complete comfort four miles above the earth's surface; the Curtiss-Wright Dubl-Check instrument board that literally thinks for the pilot; the Douglas booster control system that works for the pilots, reducing muscular fatigue in operating the airplane; metals that retain their strength qualities through any weather exposure; machines that look right through metal parts and tell the inspector what flaws are present; production machinery which slices metal like cheese, as well as cutting costs; and a host of other facts formally presented in such a way as to give attending engineers, in conjunction with the discussions, a preview of needed engineering knowledge unobtainable in any other fashion.

Stryker Opens Meeting

The meetings were opened formally Thursday morning by General Chairman C. E. Stryker, to a packed auditorium and continued playing to appreciative audiences until the sell-out crowd that jammed the Ambassador Fiesta Room for the Saturday night Banquet. There W. E. Powelson, chairman of the Southern California section, welcomed those in attendance on behalf of the four Pacific Coast Sections, the Aeronautical Chamber of Commerce of America, and the Air Transport Association of America, all of which had participated in arranging the meeting. J. H. Kindelberger, as toastmaster, then introduced C. W. Spicer, National SAE president, for a brief talk in which he urged the greatest possible broadness of vision for professional engineers as "lots of things can happen in a lifetime." He stressed the fact that the entire development of both the automobile and airplane, as well as that of the Society of Automotive Engineers itself, had come within his own lifetime. Following a series of sparkling introductions of the notables at the speakers' table, Toastmaster Kindelberger called on the speaker of the evening, the Hon. Clinton M. Hester, Administrator of the newly appointed Civil Aeronautics Authority. In his speech: "The Act, The Authority, and The Industry," Mr. Hester assured his audience that everything possible would be done to encourage and expand the aviation industry, in line with the best interests of the Nation as a whole, and with particular reference to promotion of commerce, the postal service, and the National defense.

Opening paper of the meeting was delivered by Frederick C. Pyne, Aluminum Co. of America, on "Ten Years' Service Experience With Alclad Materials in Aircraft." The author presented reassuring facts as to the corrosion resistance of the various types of Alclad aluminum-alloy sheet materials. Ten years of severe testing have confirmed the extreme reliability of this material under corrosive action, he announced. For aircraft use under the most severe conditions, he reported, no cases of loss of mechanical properties of the material had been found due to corrosion. Even where the

(*Continued on page* 18)

Fleet Operators Profit From Tulsa F. & L. Meeting Papers

By Arch L. Foster

LITTLE if any automotive equipment is built in the great Southwest oil country, but the problems of maintenance of automotive and similar equipment always loom huge. It was fitting that much of the SAE National Fuels and Lubricants Meeting at Tulsa on Oct. 6 and 7 should be devoted to a complete survey of the special problems of automotive fleet maintenance, oil-well drilling and pumping engines, the application of modern methods of choosing, servicing, and operating equipment.

Although the number in attendance at this year's meeting was smaller than last year, the excellence of the papers presented and the completeness of the coverage of the field especially from the automotive equipment operator's viewpoint provided practical information of the highest value. More than one hard-headed automotive chief stated that he had learned enough to pay him for the time and expenses many fold and that he would find the results more than profitable to himself and his company.

The program was arranged under the direction of Fuels and Lubricants Vice-President B. E. Sibley, Continental Oil Co., and General Chairman William F. Lowe, Natural Gasoline Association of America. J. V. Brazier, Barnsdall Refining Corp., was local chairman. Also serving on the committee on arrangements were: A. V. Bourque, Western Petroleum Refiners Association; G. C. Richardson, Indian Territory Illuminating Oil Co.; T. J. Schuetz, Braden Winch Co., and C. A. Tangner, of the Diesel Power Co.

Five of the eight major papers dealt with the problems faced by users of automotive and stationary prime mover equipment. Presentation of the methods developed in this country for handling the peculiar problems involved, the needs of the oil country operator, the design principles which the manufacturers should fol-

low in building engines and transportation units to fit these local conditions comprised a full training course for the builders. Men widely experienced in handling transportation, drilling and pumping organizations showed how their difficulties are simplified or aggravated by the design of the equipment used, and pointed out design practices which, if observed by the manufacturers, would produce equipment better fitted to the special conditions met in the oil and agricultural empire of the Southwest. They showed how, by systematic and scientific management of fleets, well-drilling and well-pumping organizations can reduce overall costs and make all the difference between profit and loss in operating fleets of hundreds of units.

For the efficient operation of a fleet L. L. Fawcett, of Auto Electric Co., has found that a dynamometer tune-up assembly is indispensable to the most efficient engine maintenance. These dynamometer units, he believes, will soon be commonly used for these purposes by automotive operators, since only by their use can the power and economy of an engine be determined and adjustments be made for the most efficient results. A car can be driven onto the dynamometer unit and power and air-fuel ratio curves be obtained in less than ten minutes, Mr. Fawcett said. From these data the engine can be readjusted readily and intelligently. Troubles which appear only under specific conditions can be routed out and corrected with exactness and dispatch.

The dynamometer set-up consists of two parallel rollers set to form a "valley" into which the driving wheels of the car or truck are set, with a water brake for loading, and accessory indicating and recording instruments. Wide experience shows that the air-fuel ratio should be adjusted at from 14.5 to 14.8 to 1 at medium loads, which at full load should drop to 12.8 to 13.3 to 1. Higher ratios result in poor running especially at low temperatures and during warm-up.

(*Continued on page 20*)

Joint Problems Attacked by Rail and Automotive Engineers

WHY Diesel-electric locomotives, new to this country in 1934, have been selected to propel some of America's crack passenger trains . . . . . the adoption of light-weight materials for passenger and freight cars . . . . . strides in air conditioning . . . . . and the relative merits of the Diesel, Hesselman and gasoline engines, were among the significant topics discussed at the Society's Truck, Bus & Railcar Meetings in Chicago, Oct. 4-5.

Railroads operating 75 per cent of the Diesel-powered passenger trains in the United States were represented, as well as five other railroads not yet utilizing this type of equipment. Most of them had both Diesel and air-conditioning men on hand to contribute at each of the four sessions. Total attendance reached 300; proof that modern trends in railroading are bringing mutual problems to automotive and railroad engineers.

Sponsored by the Truck, Bus & Railcar Activity, the program was arranged by the Chicago Section under the direction of Edward A. Sipp, Burgess Battery Co., who was general chairman of the meeting.

Before light-weight Diesel engines for high-speed railway service had been perfected, his company had given serious consideration to the construction of a three-car light-weight stainless-steel high-speed train, and was searching for a suitable prime mover, E. F. Weber, Burlington Lines, revealed in his opening session paper, "Diesel Power for High-Speed Railway Service."

In fact, he said, the cars were already being built in Philadelphia before an order was placed for an engine which the Winton Engine Co. had been developing quietly. It was a light-weight two-cycle Diesel engine announced in 1933.

Completed in 1934, the Burlington Zephyr was America's first Diesel-electric-powered streamlined train, he declared, calling particular attention to the belief that the engine was the first of its kind in the world in which the work load from cylinder head and crankshaft were tied together through a weld.

The challenge that "dropping from a mountain a mile high" had enabled the first Diesel-powered Burlington Zephyr to establish its long-distance non-stop record from Denver to Chicago in May, 1934, at an average speed of 77.6 m.p.h., irked the Burlington officials until October of 1936 when the 3000-hp. engine and six cars of the new ten-car Denver Zephyr reversed the course and climbed the "mile-high mountain" on a Chicago-to-Denver non-stop run at an average speed of 83.33 m.p.h., according to the speaker.

Mr. Weber believes that Diesel-electric power is preferable to the steam locomotive where the cruising speed is around 85 to 100 m.p.h.

Over the Burlington lines, he said, Diesel-electric passenger-train mileage amounts to 13.5

National

Transportation Engineering

Meeting

Sponsored by the Transportation & Maintenance and the Truck, Bus & Railcar Activities of the Society, with the cooperation of the Metropolitan Section

Nov. 14-16

Hotel New Yorker

New York

Monday, Nov. 14

2:00 P. M. — F. K. GLYNN, *Chairman*

Why Not 125 B.M.E.P. in Ell-Head Truck Engines? – F. S. BASTER, *White Motor Co.*

Tire Sizes – Not More but Better – M. C. HORINE, *Mack Mfg. Corp.*

Tuesday, Nov. 15

10:00 A. M. — C. O. GUERNSEY, *Chairman*

Diesel-Electric Bus Drives – G. W. WILSON, *General Electric Co.*

2:00 P. M. — T. L. PREBLE, *Chairman*

Instrumentation for Maintenance and Test Procedure of Electrical Equipment – W. H. YENNI, *Joseph Weidenhoff, Inc.*, and W. A. ROBERTS, *Rappuhn Corp.*

Wednesday, Nov. 16

10:00 A. M. — S. G. TILDEN, *Chairman*

New Kinks in Live Truck Operations – HENRY JENNINGS, Technical Editor, *Commercial Car Journal.*

2:00 P. M. — H. E. SIMI, *Chairman*

Trends in Commercial Vehicle Spring Suspension – N. E. HENDRICKSON, *Mather Spring Co.*

per cent of the total. "Nevertheless," he added, "these trains have proved so satisfactory in high-speed passenger service that ultimately all passenger cars will be propelled by Diesel engines."

Mr. Weber gave the mechanical specifications of the eight Burlington Zephyrs now in service, as well as an analysis of operating costs and maintenance methods in the course of his complete paper.

The discussion period, presided over by Session Chairman William H. Hubner, brought further praise of Diesel power in high-speed railway service. No one disputed the statements about the Diesel engine's superiority for this type of work – in fact representatives of the Illinois Central, Chicago & North Western, Union Pacific and the Santa Fe backed Mr.

(*Continued on page 22*)

85% of Section's Members Greet Spicer and Warner

● **No. California**

When SAE President C. W. Spicer and John A. C. Warner, secretary and general manager of the Society, visited the Northern California Section, Oct. 5, on the annual presidential tour, 85 per cent of the Section's membership turned out to greet them.

The visitors were guests of honor and speakers of the evening. Chairman G. L. Neely conducted the meeting and introduced Mr. Spicer. Mr. Warner was introduced by A. K. Brumbaugh, a past-officer of the Society.

Mr. Spicer's talk was a comprehensive dissertation on universal joints. Using slides he demonstrated different designs of universal joints and clarified the difference between constant-velocity and variable-velocity types. He declared that the common conception of the universal joint as an inefficient mechanism is unfounded, since a well-designed joint is more than 98 per cent efficient.

Mr. Spicer, in concluding his talk, challenged the engineer to assume his responsibility in our present complicated social system. The machine age is here, he declared, not something of the future. Since the engineer is involved in controlling almost every action of our present-day mechanized living, his responsibility should go beyond that of making efficient mechanical equipment; he should also use his superior ingenuity in solving social problems, Mr. Spicer stated. He suggested, therefore, that every member of the SAE should lead the way by accepting his responsibility as an individual in his community.

Picturing the SAE as an inspirational society which provides an opportunity for all engaged in automotive activities to work harmoniously as an engineering group, Mr. Warner gave his interpretation of the significance of the Society to every member. To show the wide variety of activities in which SAE members are engaged, and to show the correlation of automotive manufacturing to the accessory manufacturers, the petroleum and other industries, Mr. Warner presented a series of slides showing the activities on the proving grounds and in the laboratories of automobile manufacturers.

At the close of the meeting a moving picture was shown giving advance information on the SAE World Automotive Congress, May 22-June 8, 1939.

Lack of time made it necessary for the national officers to forego a trip to the giant redwood trees, planned under the direction of Howard Baxter, chairman of the Section's reception committee. In lieu of the trip, Mr. Baxter presented President Spicer with a potted redwood tree as a "lasting memory of his trip to the land of sunshine and big trees."

Reports on European Military Motor-Vehicles

● **Washington**

The United States should not let present military motor-vehicle designs rest on their merits or on the errors of foreign designers, said Arthur W. S. Herrington, president of Marmon-Herrington in a discussion of "Foreign Military Motor-Vehicles" before a good turnout at the Washington Section's first meeting of the year, Oct. 11. Mr. Herrington has recently returned from an extended tour of Europe.

Some European countries are well advanced in military motor equipment and are getting the benefit of mass testing, he said. Mr. Herrington believes that the building of two or three sample units for proving ground or any other test may be helpful but does not show what the unit will do in the hands of the average operator under service conditions. There is no substitute for mass testing if satisfactory equipment is desired, he added.

Totalitarian governments, the speaker said, might be compared to an organization like that of the Ford Motor Co. – they are a one-man show but they get things done quickly. In Germany, he noted, a great deal of attention is given to aviation and the air force has first claim on such material and equipment as it needs. There is still some shortage of raw materials which has some influence on the design of motorized equipment.

All-wheel drive vehicles are used largely in Germany, he continued, noting that it is said that England only recently discovered that the four-wheel drive would out-perform the two-wheel-drive vehicle. In most countries, he explained, the half-track type of drive is commonly used for the heavier vehicles. Mr. Herrington also revealed that production of caterpillar-tractor-type of vehicle for civilian commercial use is practically nil in any country except the United States. The track-laying type of drive for military vehicles is still a problem as whatever is done to improve the suspension and the ride tends to cause the track to come off, he said.

The performance of cross-country vehicles is about inversely proportional to their weight, the speaker explained, adding that this makes it very desirable to improve armor; to make thinner plates give better protection. Anti-tank guns have been highly developed, a 20-mm. gun being the smallest that can properly be called an anti-tank gun, he reported. These guns must necessarily be portable and man handled.

The Diesel engine is used almost exclusively in all but the lightest of the vehicles, the speaker stated, explaining that due to high fuel costs the development of high-speed-automotive-type Diesels has progressed further in Europe than in the United States.

Mr. Herrington also explained that lack of mass-production facilities in European countries prevents standardization of units and of servicing and maintenance work. Vehicles, he said, are seldom scrapped but may be completely rebuilt. He also noted that in general much more extensive repair work is undertaken in the field than in this country.

The motorcycle has largely replaced the cavalry, he declared. Special machines are used and the men are trained to use them the same as men are trained to use the airplane. The United States makes the mistake of treating the motorcycle like an automobile, expecting anyone to get on it and get good results with it, he stated.

The speaker explained that machine guns are mounted on the side cars and that an arrangement is made so that the side-car wheel can be clutched in and power driven to help get out of tight places. Outside of the Balkans and Russia there are more good roads per square mile in Central Europe than in the United States, he concluded.

Did Your October SAE JOURNAL Arrive?

During the truck strike in New York at the time of mailing the October SAE JOURNAL, one carton of envelopes addressed to about 250 members in the United States was lost.

If you did not receive your October SAE JOURNAL, we will be pleased to forward a copy to you immediately at your request.

Unless you do let us know, unfortunately, we have no way of knowing what names were included in the lost carton.

Compares Diesel and Steam Locomotives

● **Metropolitan**

Development of a new transmission to replace the electric-generator-and-motor-type may give the weight reduction desired for Diesel locomotives, Edmund E. Chapman, engineer of tests and mechanical assistant of the Santa Fe Railway, told some 200 members and guests of Metropolitan Section on Oct. 13.

Design of the Santa Fe's first Diesel-electric locomotives was a joint project of the railway engineers and engineers of the Electro-Motive Corp., Mr. Chapman said, and told how lubrication troubles led to substitution of roller bearings for plain axle bearings and how wheel trucks and wheels had to be redesigned to withstand heavy braking at high speeds. He went on to compare the 583,400-lb., 3600-hp., 118-m.p.h. Diesel locomotives costing from $100 to $110 per indicated horsepower and weighing 162 lb. per hp. with new 895,900-lb., 4300-hp., 100-m.p.h. steam engines costing $35.40 per indicated horsepower and weighing 188 lb. per hp.

With Diesel-electrics, high tractive effort means rapid acceleration and a lower maximum speed for a given average speed, but the particular advantage of the Diesel locomotive is the distance it can travel between refuelings, he said. Because of greater maximum horsepower, Mr. Chapman added, the new steam locomotives can maintain higher speeds on heavy ascending grades. In his discussion of fuel oil and lubrication it was indicated there must be an improvement of Diesel lubricating oil to get away from its susceptibility to lacquering, which causes stuck rings.

Otto Jabelmann, assistant to the president in charge of research, Union Pacific Railroad, spoke on the "Streamliner" services on that system and explained at some length the difficulties caused at high speeds by grit-abrasion to bottoms and sides of trains including the sand-blasting of side-windows.

W. H. Mussey, engineer of research for Pullman-Standard Car Manufacturing Co., outlined the historical background of high-speed passenger-train development and then analyzed the problems involved in car construction with aluminum and with steel. Motion pictures illustrated the papers.

(*News of Society continued on page 18*)

1938 S.A.E. *Annual Dinner*

With

B. C. Forbes, Leading Business Commentator

as Toastmaster

Introducing

H. W. Prentis, Jr.

President, Armstrong Cork Co. A foremost spokesman for modern industry, Mr. Prentis has a background of educational and business experience augmented by service as a director of the National Industrial Conference Board, as regional vice-president of the National Association of Manufacturers, and as a director of the Chamber of Commerce of the United States.

Before starting with the Armstrong Cork Co. in 1907, Mr. Prentis had been secretary of the University of Cincinnati and secretary to the president of the University of Missouri. He had received his A B. degree from the latter school and his M. A. from the former. Recently Mr. Prentis was elected a trustee of the Wilson College for Women and, in 1932, Hampden-Sydney College conferred a Doctor of Laws degree upon him.

He rose from advertising manager to president of the Arms rong Cork Co. in 27 years of steady business advancement and has run that progressive business organization vigorously and successfully since 1934. Besides being a practical industrial executive he is credited with being a really fine raconteur.

H. W. Prentis, Jr.

Speaking on:

"Patriotism and Sound Business Practices"

And

Grover Whalen, President, New York World's Fair, Inc.

Entertainment by:

Paul Whiteman
And his Variety Show

Reservations should be sent in advance to SAE Headquarters, 29 West 39th Street, New York City, accompanied by checks for five dollars per place. Reception is at six; dinner at six-thirty.

MONDAY, NOVEMBER 14th

HOTEL COMMODORE · NEW YORK CITY

About SAE Members:

Running for Governor

JULIUS P. HEIL, founder and president-treasurer of the Heil Co., Milwaukee, won the Republican nomination for governor of Wisconsin in his first venture into politics. He will oppose Philip

J. P. Heil
Nominated

F. LaFollette, incumbent, at the general election, Nov. 8. Mr. Heil has been an SAE member since 1921.

SAE Speakers

WILLIAM S. KNUDSEN, General Motors president, at the International Day conference-luncheon, Nov. 14, sponsored by the Automobile Manufacturers Association for foreign visitors to the Automobile Show. . . . **B. D. KUNKLE,** director of the G.M.C. manufacturing staff, spoke at the industrial relations conference of the New York Association of Foremen's Clubs. . . . **WILLIAM B. STOUT,** president, Stout Engineering Laboratories and past-president of the SAE, was dinner speaker at the fall meeting of the American Institute of Mining and Metallurgical Engineers, Detroit, Oct. 17-20. . . . **H. A. TOULMIN, JR.,** at the annual meeting of the Associated Machine Tool Dealers of America in Cincinnati last month.

Gold Medal

RAYMOND LOEWY, industrial designer and transportation expert, recently received a gold medal from the French Government for his contributions to American transportation design as represented by new railroad equipment shown at the Paris Exposition. Mr. Loewy returned to America last month after studying design trends in France, England and Scandinavian countries.

At Safety Congress

Celebrating its silver anniversary the National Safety Council met in Chicago, Oct. 10-14. SAE men on the program included: **COL. E. S. GORRELL,** Air Transport Association of America; **RALPH S. DAMON,** American Airlines; **L. CLAYTON HILL,** The Murray Corp. of America; **PAUL G. HOFFMAN,** Studebaker Corp., **H. H. KELLY,** section of safety, Bureau of Motor Carriers, Interstate Commerce Commission; **B. J. LEMON,** U. S. Rubber Products, Inc.; **F. B. LAUTZENHISER,** International Harvester Co.; **J. W. LORD,** Atlantic Refining Co.; **E. W. TURLEY,** Olson Transportation Co.; **MILLER McCLINTOCK,** Bureau for Street Traffic Research, Yale University; **DR. A. R. LAUER,** Iowa State College.

Transfers

C. H. KOON, by International Harvester Co., from Chicago to Milwaukee as assistant branch manager. . . . **MERRITT E. COLLINS,** laboratory manager, Ethyl Gasoline Corp., from Kansas City to San Bernardino, Calif. . . . **JOHN W. DILLON,** purchasing agent, International Harvester Co. of Canada, Ltd., takes same position with International Harvester Co. of Australia, Pty., Ltd., at Melbourne. . . . **E. F. TOMLINSON,** by B. F. Goodrich Co., from Chicago to Milwaukee in charge of manufacturers' sales. . . . **W. H. HERBERT,** by Bell Telephone Co. of Canada, Ltd., from supervisor, E.O.D., Ottawa, to vehicle superintendent, eastern division, at Montreal. . . . **CHRIS BOCKIUS,** development manager, Raybestos-Manhattan, Inc., from Bridgeport, Conn., to Passaic, N. J.

International President

WILLIAM L. BATT, president of SKF Industries, Inc., is the first American to be president of the International Committee on Scientific Management.

W. L. Batt
Elected

He was elected to this office on Sept. 23, during the Seventh International Management Congress in Washington, D. C. His term expires in 1941. . . . Mr. Batt recently was elected a director of the United American Bosch Corp.

HOY STEVENS is treasurer and sales manager of the Lub-Rim-Eter Division of the Inspection Machinery Co., Cleveland. He was formerly process engineer with the Cleveland Railway Co. Mr. Stevens is chairman of the Cleveland Section's student activities committee.

MAJ. VERNON PETERSON, formerly at C.C.C. headquarters, Fort Douglas, Utah, is now owner of Peterson's Richfield Service, Oakland, Calif.

Faculty Members

J. A. BOLT, formerly instructor of mechanical engineering at the University of Michigan, is on the mechanical engineering staff of the University of Illinois. . . . **J. L. DILWORTH** is at Virginia Polytechnic Institute as instructor in the mechanical engineering department. He was with Virginia Electric & Power Co. . . . **M. ROGER CLAPP** has joined Case School of Applied Science, Cleveland, as instructor. He was assistant in the mechanical engineering department at Purdue University.

Promotions

KARL M. WISE has been advanced to the post of director of engineering, Bendix Products Division of Bendix Aviation Corp. Mr. Wise joined the

Karl M. Wise
Advanced

Bendix forces in 1934, became assistant director of engineering in 1936 and has worked on several special assignments since that time. . . . **MARK E. ZIMMERER,** chief engineer of Kingston Products Corp. since 1931, adds "vice-president in charge of production" to his title. . . . **OSCAR P. LYNCH** has been advanced from assistant superintendent to superintendent of transportation by the Humble Oil & Refining Co. . . . **CHARLES A. MARIEN, JR.,** who has been manager of the Southeastern district for Ramsey Accessories Manufacturing Corp., has had the Southern district added to his territory.

NICHOLAS FODOR, who has been engineer in charge of oil-engine development work, Allis-Chalmers Manufacturing Co., for the past four years, has been named vice-president in charge of engineering of the Diesel Equipment Corp. He will be located in Chicago.

Items

COL. G. F. JENKS, chief of technical staff in the office of the U. S. Army Chief of Ordnance, has been elected first vice-president of the American Welding Society. . . . **CAPT. SAMUEL V. KRAUTHOFF,** U. S. Army, is attending the Command and General Staff School at Ft. Leavenworth, Kan. . . . **PER K. FROLICH,** research director, Standard Oil Development Co., is the new chairman of the Petroleum Division of the American Chemical Society. . . . **PAUL G. HOFFMAN,** president of Studebaker and of the Automotive Safety Foundation, recently was appointed to the Public Relations Committee of the Automobile Manufacturers

Association. Mr. Hoffman was one of the speakers at the Sixth Annual Meeting of the American Association of Motor Vehicle Administrators, Detroit, Oct. 4-8. . . . The jury of the James F. Lincoln Arc Welding Foundation judged a paper on Welded Ferries by **HANS A. BRANDERS** worthy of an honorable mention award of $101.75. He is production engineer, assistant to technical director, A. Ahlstrom Co., Warkaus, Finland.

SAE Globe Trotters

CHARLES F. KETTERING, vice-president of General Motors Corp. in charge of research, has returned from a visit to Europe. . . . **KIRKE W. CONNOR,** president of Micromatic Hone Corp., left Oct. 8 to spend six or eight weeks visiting England, France, Germany, Sweden and Russia. While abroad he will address several engineering societies. . . . **M. D. MUNN,** transportation engineer, export division, Chrysler Corp., stationed in Buenos Aires, recently visited Detroit and Cleveland.

Changes

SID G. HARRIS, past-chairman of the Metropolitan Section, from Macmillan Petroleum Corp. to Faber Laboratories,

Sid G. Harris
Joins Faber

Inc., as sales engineer and eastern representative, with headquarters in New York. . . . **WILLIAM H. LERNER,** from Olds Motor Division of G.M.C. to Standard Naphthalene Products Co., South Kearny, N. J., as assistant superintendent. . . . **A. N. PETROFF,** from Glenn L. Martin Co. to Curtiss Aeroplane Division, Curtiss-Wright Corp., Buffalo, as designer. . . . **JOSEPH F. BECK,** from Ford Motor Co. to Transitone Automobile Radio Corp., Detroit, as draftsman. . . . **FRANK R. SIMMONS,** from General Motors Truck & Coach Division, Yellow Truck & Coach Manufacturing Co., to Sun Oil Co., Philadelphia, as supervisor of motor equipment. . . . **CARL A. TANGNER,** from Downtown Chevrolet Co., Tulsa, to the Diesel Power Co. of the same city, as general manager.

DONALD L. BOWER recently has been transferred from the Corps of Engineers of the War Department to the Planning and Development Division of the Civil Aeronautics Authority. He will be located in Washington, D. C.

SAE Appointments

E. W. LAGER, C. O. GUERNSEY and **C. O. BALL** have been named to represent the Society on the American Society of Refrigeration Engineers' committee on rating and testing refrigerated trucks and buses.

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S·A·E Student Branches

PURDUE UNIVERSITY

IN two nights and a day last year 14,000 people crowded into the Purdue University Armory to see the third annual auto show sponsored solely by members of the SAE Student Branch at the University. Practically every standard make of car was exhibited; oil and accessory companies had displays and modern motorized military equipment was demonstrated. The entire show from administration to manual labor was a Student Branch undertaking.

This and other activities place the SAE Student Branch among the foremost organizations on the Purdue Campus. The Branch was established in 1936 when the Society awarded a charter to a group of automotive-minded students which had been organized for more than ten years. Official recognition by the National Society stimulated the activity and membership of the group.

Meeting every two weeks during the school year, the Branch also has its own Annual Dinner which is often attended by the president and general manager of the National Society. All SAE members are invited to participate and many come from nearby and distant Sections.

Data Supplied by Frank L. Coers, 1937-1938 Vice-Chairman of the SAE Student Branch at Purdue University, Lafayette, Indiana.

Members of the Student Branch attend many regular meetings of the Indiana Section, and the information gained is passed on to the group at its next meeting.

In the spring, Student Branch members take part in conducting the crowds, attending Purdue's annual Open House, through the automotive and aeronautical laboratories and demonstrating the modern equipment they house.

Purdue University is a land-grant college under exclusive control of the State of Indiana and is supported chiefly by State and Federal funds. It was founded in 1869 and named after John Purdue, an early benefactor.

With a total enrollment of more than 6200 students, 3600 of which are studying to be engineers, Purdue is rated as the largest engineering school in the country. Besides mechanical engineering, courses are offered in electrical, chemical, civil,

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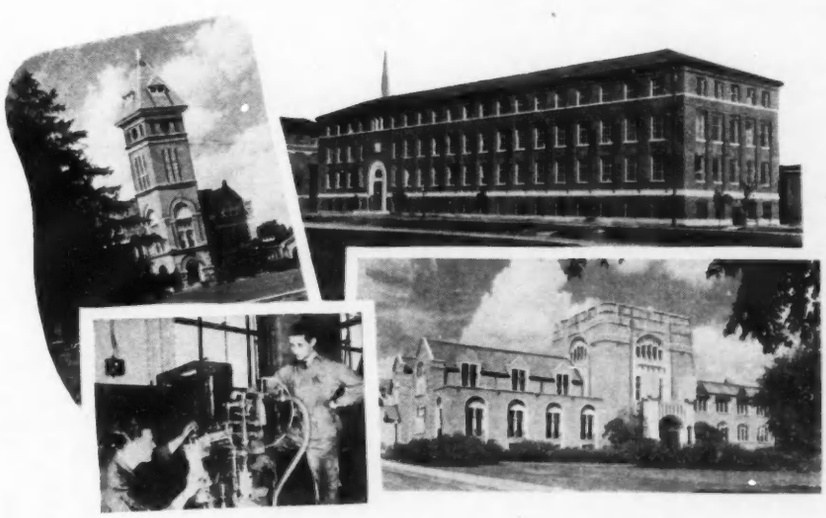

Purdue Campus Scenes. Historic Heavilon Hall, *top left*; Mechanical Engineering Building, *top right*; Laboratory Scene, *lower left*, and the Purdue Memorial Union Building, *lower right*.

At A.T.A. Meeting

SAE members were prominent at the four-day Annual Meeting of the American Transit Association in Toronto last month. Among those on the program were: **JOHN D. SUREAU,** Third Avenue Railway System, N. Y., president of the Purchases and Stores Association; **E. S. PARDOE,** Capital Transit Co.; **J. R. ST. GERMAIN,** Ethyl Gasoline Corp.; **B. W. WESTCOTT,** Zenith Carburetor Division, Bendix Aviation Co.; **W. S. RAINVILLE, JR.,** New Orleans Public Service, Inc.; **C. W. STOCKS,** *Bus Transportation;* **F. G. SHOEMAKER,** Detroit Diesel Engine Division, General Motors Corp.; **D. E. BLAIR,** Montreal Tramways Co.; **C. O. GUERNSEY,** J. G. Brill Co.

1938 SAE Graduates

LEONARD G. SCHNEIDER, Michigan State, to University of Wisconsin as instructor in mechanical engineering. . . . **CLYDE L. HEDRICK,** University of California at Los Angeles, heads the mechanical arts department at the Palm Springs (Calif.) High School. . . . **JOHN G. LOWRY,** University of California, to the U. S. Engineers, San Francisco. . . . **RAYMOND A. GAITHER,** Purdue, to John Deere Tractor Co., Waterloo, Iowa, as experimental engineer. . . . **JOSEPH D. TAYLOR,** Pratt Institute, to Agfa Ansco Corp., Binghamton, N. Y., as tool designer, camera works. . . . **HERBERT R. PASS,** New York U., to Langley Field, Va., as junior aeronautical engineer with National Advisory Committee for Aeronautics.

New Positions

W. S. FORTNEY, is superintendent of tires and accessories for the Cities Service Oil Co., Ft. Worth, Texas. He was formerly superintendent of the power-prover department. . . . **JULIUS L. BROWN,** previously with Ward Motor Vehicle Co., Mt. Vernon, N. Y. is draftsman with Lawler Automatic Controls, Inc., of the same city. . . . **LEW GOGOL** has joined the Fisher Body Division of G.M.C. as draftsman. . . . **ROBERT H. ADAMS,** is salesman for Consolidated Motors, Inc., Phoenix, Ariz. . . . **EDGAR J. DOUGLAS,** from Packard Motor Car Co., to Transitone Automobile Radio Corp., Detroit, as sample checker.

JAMES R. FITZPATRICK is a partner in the recently organized Carstenite Sales Co., Chicago, dealing in Carstenite and technical plywoods for use in transportation, building and industrial fields. He was previously sales director, Algoma Plywood & Veneer Co.

Purdue University

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public-service and industrial engineering. There is also a three-year preparatory course in engineering law in conjunction with Indiana University. Each department has complete laboratories for graduate and under-graduate work. Purdue is one of the few universities possessing an airport.

SAE members serving on the Purdue faculty include Prof. G. A. Young, head, School of Mechanical Engineering; H. M. Jacklin, professor of automotive engineering; K. D. Wood, professor of aeronautical engineering; Joseph Liston, assistant professor, aeronautical engineering; Paul Bauer, instructor, mechanical engineering; W. L. Hull, instructor, mechanical engineering.

Among Purdue graduates who are SAE members are: S. O. White, H. A. Huebotter, John P. Heiss, William B. Barnes, A. J. Mummert, H. O. Mathews, T. C. Smith, C. B. Veal, A. F. Stamm, V. P. Rumely, Opie Chenoweth, W. L. Batt, I. J. Reuter, Roscoe C. Hoffman, and J. E. De Long.

SAE *Coming* EVENTS

Baltimore – Nov. 3

Engineers' Club; dinner 6:30 P.M. Tank Mileage – J. B. Macauley, Jr., research engineer, Chrysler Corp.

Buffalo – Nov. 15

Hotel Statler; dinner 6:30 P.M. Aircraft Production Problems – Don R. Berlin, chief engineer, Curtiss Aeroplane Division, Curtiss-Wright Corp. Application of Automotive Production Methods to Aircaraft Manufacture – Peter F. Rossmann, production design engineer, Curtiss Aeroplane Division, Curtiss-Wright Corp. Tools for Aircraft Production – John Lee, chief tool designer, Curtiss Aeroplane Division, Curtiss-Wright Corp. There will be a special display of aircraft production tools and parts, and a motion picture entitled "Fabrication of Aluminum for Aircraft."

Canadian – Nov. 16

Annual Montreal Meeting.

Chicago – Nov. 11

Saddle and Sirloin Club, Stock Yards; dinner 6:45 P.M. Engineering Developments for 1939 – Joseph Geschelin, Detroit technical editor, Chilton Co.

Cleveland – Nov. 14

Cleveland Club; dinner 6:30 P.M. Trends in Truck and Bus Design – Robert Cass, White Motor Co.

Dayton – No Meeting

Detroit – Nov. 14

Hotel Statler; dinner 6:30 P.M. Engineering Developments for 1939 – Austin M. Wolf, automotive consultant. This dinner and meeting is restricted to SAE members. Art on Wheels – Henry Dreyfuss.

Indiana – Nov. 10

Antlers Hotel, Indianapolis; dinner 6:30 P.M. Late Developments in Powerplant Engineering – Max M. Roensch, powerplant development engineer, Chrysler Corp.

West Coast Transportation and Maintenance Meeting

Nov. 3-5 **Los Angeles**
Elks Club

Annual Dinner

Nov. 14 **New York City**
Commodore Hotel

National Transportation Engineering Meeting

Nov. 14-16 **New York City**
Hotel New Yorker

Annual Meeting

Jan. 9-13, 1939 **Detroit, Mich.**
Book-Cadillac Hotel

Kansas City – No Meeting

Metropolitan – Nov. 14-16

Participation in the National Transportation Engineering Meeting of the Society at the Hotel New Yorker.

Milwaukee – Nov. 4

New Mechanical Engineering Bldg., University of Wisconsin, Madison; 1:30 P.M. Inspection trips to Forest Products Laboratory and Madison Kipp Laboratory. Dinner 6:15 P.M. Wisconsin Union. Meeting at 7:45 P.M. in the Old Engineering Building, with William Littlewood, vice-president in charge of engineering, American Airlines, Inc., speaking on Air-Transport Engineering.

New England – Nov. 22

Engineers' Club; dinner 6:30 P.M. The Trend in 1939 Passenger Cars – Dean A. Fales, associate professor of automotive engineering, Massachusetts Institute of Technology.

Northern California — Nov. 1

Hotel Leamington, Oakland; dinner 6:30 P.M. What the Parts Manufacturer Can Do to Reduce Cost of Operation – A. T. Colwell, vice-president in charge of engineering, Thompson Products, Inc. There will also be sound moving pictures and demonstrations.

Northwest—Nov. 18

Portland, Ore. Refining of Engine Lubricants – S. C. Schwarz, chemical engineer in charge of production, Refining Industries, Inc.

Oregon – Nov. 12

Lloyds Club House, Portland; dinner 6:30 P.M.

Philadelphia – Nov. 9

Engineers' Club; dinner 6:30 P.M. Fuels and Lubricants – A. L. Clayden, research engineer, Sun Oil Co.

Pittsburgh – Nov. 15

Webster Hall Hotel, 4415 Fifth Avenue; dinner 6:30 P.M. Winter Conditioning Versus Sludge, Crankcase Dilution, Fuel and Oil Economy.

Southern California – Nov. 3-5

Elks Club, Los Angeles. West Coast Transportation and Maintenance Meeting.

Southern New England – Nov. 2

Bond Hotel, Hartford, Conn.; dinner 6:30 P.M.

Syracuse – Nov. 21

Onondaga Hotel; dinner 6:30 P.M. Engineering Features of 1939 Motor Cars – Joseph Geschelin, Detroit technical editor, Chilton Co.

Washington – Nov. 8

Cosmos Club; dinner 6:30 P.M. Engineering Developments for 1939 – Austin M. Wolf, automotive consultant.

Applications Received

The applications for membership received between Sept. 15, 1938, and Oct. 15, 1938, are listed herewith. The members of the Society are urged to send any pertinent information with regard to those listed which the Council should have for consideration prior to their election. It is requested that such communications from members be sent promptly.

Buffalo Section

BARRESE, LOUIS, fleet operation, Rochester Packing Co., Rochester, N. Y.

GEIST, CARL A., drafting, Curtiss Aeroplane Division, Buffalo, N. Y.

Canadian Section

JOHNSON, WILFRED, analyzer of motors, National Motors Ltd., Toronto, Ont.

TELFORD, ROBERT J., vice-president and general manager, Reo Motor Co. of Canada Ltd., Leaside (Toronto).

Chicago Section

EDELMANN, ROBERT B., vice-president, E. Edelmann & Co., Chicago.

Cleveland Section

FARKAS, RAYMOND Z., draftsman, Hercules Motors Corp., Canton, O.

KENNEDY, RAYMOND, inspector of engineering material, U. S. Navy Department, Lakewood, Ohio.

Detroit Section

BAER, SIMON, designing engineer, Baer Engineering Co., Detroit.

MORAN, ALFRED B., salesman, Eaton Mfg. Co., Detroit.

Indiana Section

HAMILTON, MAURICE L., engineer, Sinclair Refining Co., East Chicago, Ind.

Metropolitan Section

JONES, LINCOLN, JR., operations manager, Middlesex Transportation Co., New Brunswick, N. J.

KURTI, ALEXANDER, designer, 964 Fox Street, Bronx, New York.

PASCOE, EDWIN WILLS, draftsman, Wright Aeronautical Corp., Paterson, N. J.

SKIOLVIG, AGE, manager, technical department, Shell Union Oil Corp., New York.

WILLIAMS, VIRGIL O., mechanic, Packard Motor Car Co., New York.

Milwaukee Section

FRIEND, JAMES A., vice-president and purchasing agent, Nordberg Mfg. Co., Milwaukee.

SICKERT, GENE D., assistant sales manager, Perfex Corp., Milwaukee.

New England Section

WILKINSON, JAMES WILLIAM, chief engineer, Fleming Mfg. Co., Providence, R. I.

Northern California Section

GRIEP, E. F., research engineer, Standard Oil Co. of California, Richmond, Calif.

WARD, ROBERT M., representative, Champion Spark Plug Co., San Francisco.

Northwest Section

HOWE, THEODORE C., superintendent of equipment, North Coast Transportation Co., Seattle, Wash.

Philadelphia Section

RADBILL, SAMUEL, president, Radbill Oil Co., Philadelphia.

Pittsburgh Section

BLACK, FRANK E., engineering assistant, Gulf Research & Development Co., Pittsburgh.

DAVIS, WILLIAM E., chief metallurgist, Pittsburgh Crucible Steel Co., Midland, Pa.

St. Louis Section

PHELPS, C. H., development engineer, Weaver Mfg. Co., Springfield, Ill.

Southern California Section

GROSS, ROBERT E., president, treasurer and chairman of Board, Lockheed Aircraft Corp., Burbank, Calif.

LILLY, RALPH DONALD, machinist, Keystone Engineering Co., Los Angeles.

Southern New England Section

BATORI, STEPHEN M., maintenance engineer, Conn. Railway & Lighting Co., Bridgeport.

BROSSEAU, ALPHONSE L., owner, Brosseau's Garage, Springfield, Mass.

CROCKER, ALBERT R., engine tester, Pratt & Whitney Aircraft Co., East Hartford, Conn.

Outside of Section Territory

BOEHMISCH, WILLIAM, foreman, Indian Territory Illuminating Oil Co., Oklahoma City, Okla.

MAINS, JOHN T., department manager, W. R. Stephens Co., Minneapolis, Minn.

PHILLIPS PETROLEUM CO., Bartlesville, Okla.

Foreign

BAPTIST, WILLIAM E., The de Havilland Aircraft Co. Ltd., Middlesex, England.

GARROTT, MARTIN, Pan American Airways System, Rio de Janeiro, Brazil, S. A.

RENTIERS, JACQUES, managing director, Garciel Nautique, Antwerp, Belgium.

SMITH, EDWARD M., Thornycroft (Aust.) Pty. Ltd., Sydney, N. S. W., Australia.

EVERSON, BERNHARD INGVAR, assistant to superintendent, Transportation Division, Supply Department, Panama Canal.

TATTON, AVON CECIL, proprietor, Rangatira Service Station & Garage, Masterton, New Zealand.

WHITE, NEVILLE WALTER, aircraft engineer, Ansett Airways, Essenoon Aerodrome, Melbourne, Australia.

New Members Qualified

These applicants who have qualified for admission to the Society have been welcomed into membership between Sept. 15, 1938, and Oct. 15, 1938.

The various grades of membership are indicated by: (M) Member; (A) Associate Member; (J) Junior; (Aff.) Affiliate Member; (SM) Service Member; (FM) Foreign Member.

Buffalo Section

KUNZ, WILLIAM W. (M) master mechanic, International Railway Co., Buffalo, N. Y. (mail) 1581 Michigan Ave.

Canadian Section

SMITH, THOMAS MCKENZIE (A) purchasing agent, supervisor, fleet operations, Supertest Petroleum Corp., Ltd., Supertest Bldg., London, Ont.

WALTON-BALL, ALBERT ERIC C. (A) sales manager, Stromberg Spark Plug Co. of Canada, Toronto, Ont. (mail) 2 Gould St.

YOUNG, BRUCE WOLFE (A) advertising manager, Collins & Aikman of Canada, Ltd., Room 1212, York Piper Bldg., Toronto, Ont.

Chicago Section

CREW, BEN L. (A) sales engineer, Ajax Electric Co., 333 N. Michigan Ave., Chicago (mail) 1335 Ashland Ave., Wilmette, Ill.

Cleveland Section

KENNEDY, W. MURRAY (M) engine design engineer, White Motor Co., 839 E. 79th St., Cleveland.

Dayton Section

MACK, H. A. (A) division manager, Ethyl Gasoline Corp., Mutual Home Bldg., Dayton, Ohio.

Detroit Section

BURROUGHS, LAURENCE RUSSELL (M) research engineer, Ethyl Gasoline Corp., 723 East Milwaukee Ave., Detroit.

DAVIDSON, STUART E. (M) mechanical engineer, Bower Roller Bearing Co., 3040 Hart, Detroit (mail) 18 Lorraine Court, Pontiac, Mich.

GILLIG, FERD (J) assistant, aeronautical research, Ethyl Gasoline Corp., 723 East Milwaukee Ave., Detroit.

PORTER, CHARLES F. (M) engineer, Chrysler Motor Car Corp., Detroit (mail) 220 McLean Ave., Highland Park, Mich.

STONE, DONALD D. (M) research engineer, Willys-Overland, Research Dept., Toledo, Ohio.

Indiana Section

JOHNSON, ABBOTT LIVINGSTON (M) vice-president, general manager, Warner Machine Products, Inc., Muncie, Ind.

Metropolitan Section

DAMON, NORMAN (A) director, Automotive Safety Foundation, 366 Madison Ave., New York.

ROBERTS, WALTER A. (M) manager, equipment division, Rappuhn Corp., 30-01 Northern Blvd., Long Island City, N. Y. (mail) 41-24 29th St.

WEBB, EARLE W. (A) president, Ethyl Gasoline Corp., Chrysler Bldg., New York.

Oregon Section

SNEAD, JOHN L. S., JR. (A) chief engineer, Consolidated Freight Lines, Inc., 2029 N. W. Quimby, Portland, Ore.

Southern California Section

FLEET, REUBEN HOLLIS (M) president, Consolidated Aircraft Corp., Lindbergh Field, San Diego, Calif.

Southern New England Section

VERNIER, MARCEL GEORGE (J) test inspector, Pratt & Whitney Aircraft Engine, East Hartford, Conn. (mail) 393 Main St.

Outside of Section Territory

EELLS, DON V. (A) superintendent (Refinery), Cities Service Oil Co., Okmulgee, Okla. (mail) 620 S. Okmulgee Ave.

HESS, ALVA (A) manager, Hess Auto Repair, Buckhannon, West Va.

MAYNARD, CHARLES EDGAR (M) factory manager, Fisk Rubber Corp., Chicopee Falls, Mass.

SPEAKS, CHARLES E. (A) president, Fisk Rubber Corp., Chicopee Falls, Mass.

Aircraft Production Meeting

(*Continued from page* 10)

Alclad coating had been scratched, Mr. Pyne pointed out, there was no tendency for corrosive action to strike the alloy core, due to a protective electrolytic action which resisted corrosion. Nor were such scratches in the protective coating a source of fatigue failures in parts subjected to vibration according to all available service test results, he added.

F. R. Shanley, of the Curtiss-Wright Technical Institute, asked if shop practices might not be relaxed with respect to handling of Alclad sheet materials, as the accepted motto had been: "Scratched Alclad is scrapped Alclad." The author replied that some relaxation of shop vigilance might be acceptable. Mr. Shanley also commented on the need of Alclad protection for extruded sections, as this protection is now only available on sheet material, forcing designers to choose between the two types of structures necessitated by use of one or the other material. He also commended Alclad as being well suited to spot-welding.

Session Chairman Peter A. Beck, Lockheed Aircraft Co., then discussed the pitting type of corrosive attack on Alclad, and this discussion was joined by L. L. Bonham, also of Lockheed. Both felt that, whereas Alclad was safely resistant to such pitting attacks, for appearance's sake a protective coating was desirable over such surfaces as might be subjected to the action of exhaust gases which produced sulfide, chloride, and bromide compounds. Mr. Bonham praised the qualities of zinc-chromate primer, an inhibitive primer which serves as "a watchman to watch the watchman" and so further guarantees against corrosion. The author agreed that this practice would be justified in some cases, but felt there was no need to return to a wide use of anodizing and priming as has been done in the past.

Advantages of Stainless Steel

Due to the inability of V. W. Whitmer, metallurgist of the Republic Steel Corp., to be present, his paper: "Stainless Steel in Aircraft" was read by Howard C. Stroup, of Republic Steel Corp. The author stressed the high strength-weight factor of modern stainless steel alloys in thin strip form, which he felt was higher than commonly used light alloys. 18-8 stainless steel was commended by the author for its superior characteristics as a structural material, though a similar alloy 18-8-S has long been used for exhaust manifolds and other equipment requiring high heat resistance. The 18-8 alloy is highly corrosion-resistant, attains a tensile strength of 185,000 lb. per sq. in. when cold-rolled, and fabricates easily due to its ductility, he reported. It has been used in wing construction in light gages down to 0.005 or 0.006 in., Mr. Whitmer continued, though it may be more desirable to confine its use to 0.008 or 0.010 in. thickness, thus eliminating its use on small aircraft. However, it should still prove quite successful for the heavily stressed members of larger aircraft, he added.

Other advantages of the material were emphasized, such as its adaptability to spot-welding or seam-welding, and its high corrosion resistance which makes any form of protective coating entirely unnecessary. For parts exposed to the constant action of sea water, a variation of the alloy known as 18-8-S-Mo is desirable, he pointed out. Exposure tests over a period of 12 years have shown this material to be unaffected by atmospheric corrosion, he reported.

Commenting on the paper, Mr. Cornwell, of the Budd Co., pointed out that stainless steel must be highly stressed in order to capitalize on the high strength of the material. Harold Acker, of the Fuller Paint Co., who helped to develop the zinc-chromate type primer in this Country, felt that much exposure testing had been poorly done and that properly severe tests would show the need of some protective coating at points subject to accelerated corrosive action. He particularly mentioned joints, seams, and corners. Dr. A. L. Klein, of California Institute of Technology, expressed the belief that the supposed advantages of stainless steel over light alloys for structural purposes disappears when similar types of structures were used in each case.

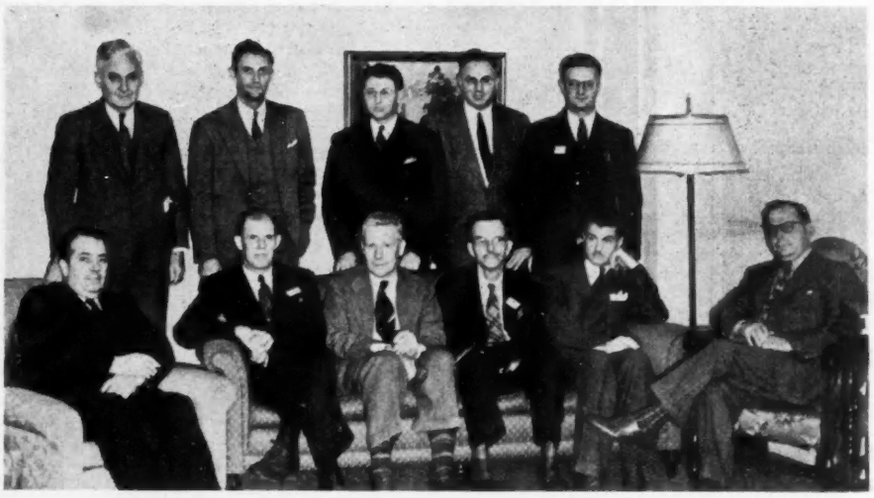
Demonstrates Profilometer

R. W. Palmer, chief engineer of Vultee Aircraft, presided at the evening session. The opening paper: "Measuring Surface Finish in Production" by Dr. Ernest J. Abbott, Physicists Research Co., proved an absorbing topic. The paper was not only illustrated with slides, but the author had brought along the Profilometer which was the subject of the paper and actually demonstrated it at great length by measuring surface roughness of various materials. Readings were projected on the screen to show the audience graphically the remarkable range and sensitiveness of this new production tool. Through use of the Profilometer a number of manufacturers are finding it possible to control accurately the degree of surface smoothness or roughness of various parts, Dr. Abbott announced. The author stressed the fact that, in some parts, roughness is wanted, rather than smoothness, as on certain rolled sheet metals which are to be painted. Paint will not adhere readily to the smooth metal and so a desirable and uniform degree of roughness must be provided. Through use of the Profilometer, he continued, it has been possible to produce better ground and honed surfaces, and also reduce production costs, through an accurate knowledge of when the finished surfaces are of a desired smoothness. In some cases surface smoothness defeats its own purpose if other dimensions are not accurately held, he pointed out. In general, he concluded, the rapid improvement in surface finish and hardness is making it possible for machinery to "wear in before it wears out." Profilometer readings also provide a means of specifying degree of smoothness on working drawings, he added. The Profilometer, Dr. Abbott explained, consists of a diamond contact point which operates a tracer arm that in turn generates an electric current of voltage variable with the roughness of the surface. This voltage is amplified and indicated on a meter graduated in micro-inches, or millionths of an inch. In practice the Profilometer does not show the total height of surface irregularities but rather obtains a running average of the height of such irregularities, he pointed out. In written discussion read by the Chairman, C. R. Lewis, of the Chrysler Corp., praised the work that the Profilometer is doing for his firm. He commented that the instrument became a laboratory tool rather than a shop tool for measurement of surfaces with a smoothness finer than 5 micro-in. Although he found that the Profilometer did no damage to the finest surfaces in connection with readings taken, he feels that Profilometer readings did not give complete information on a surface, as surfaces with similar Profilometer readings might have widely varying reactions in service. In reply, the author agreed that the Profilometer was not intended for shop use for the measurement of very fine surfaces and said that, of course, surface roughness readings did not show a complete picture of a surface, such as the direction of machining.

In answer to a question by Dr. Klein, the author said the instrument could be used for measurement of painted surfaces, though such surfaces were usually either too soft or too smooth for satisfactory measurement. Dr. Klein pointed out that, with super-smooth surfaces becoming more common in high-speed aircraft, a specification of what is an aerodynamically smooth surface is important. In further comment Dr. Abbott gave an example of the value of improving surface finish in which oil consumption in an engine had been cut to one-fourth by reducing the cylinder-wall roughness from 13 to 8 micro-in. He said the instrument was as useful for measuring the surface of rolled sheet metal as for machined or ground parts. He stated further that methods had been developed for using the machine to diagnose waviness as well as roughness of a surface and then both together. Without this knowledge, he explained, roughness might be lessened but waviness increased, resulting in a surface of less practical value than at the start.

G. P. Thorn, of Wright Aeronautical Corp., read the paper "Interpretation of Magnaflux Indications" in the absence of the author, Bishop Clements, also of Wright Aeronautical Corp. Stressing the value of magnaflux inspection as

Pre-Meeting Gathering at Los Angeles



Seated: **SAE Secretary and General Manager John A. C. Warner; Carleton E. Stryker, general chairman of the meeting; Frank W. Caldwell, SAE vice-president representing aircraft engineering; C. W. Spicer, president of the Society; R. W. Palmer, session chairman; and Robert J. Pritchard.**

Standing: **Ellis W. Templin, vice-chairman of Southern California Section; Howard C. Stroup; Peter F. Rossman; A. H. Leak, speaker; and T. P. Wright.**

a production tool, the author also stated that "Magnaflux has been misused, is being misused, and will continue to be misused." Outlining the three different methods of magnaflux examination, the paper stated that the selection of method and interpretation of results must be done by a skilled and experienced operator. Numerous slides were shown to illustrate typical cracks or flaws as revealed by the magnaflux method.

A further treatment of the subject of magnaflux by J. B. Johnson, Material Branch, U. S. Army Air Corps, Wright Field: "Magnaflux, What Does it Show?" was read by L. L. Snow, of Pratt & Whitney Aircraft. Treating in detail the various types of flaws revealed by the magnaflux method, such as inclusions, surface abrasions, cracks, blow-holes, and so on, the author declared that "Magnaflux inspection is the most rapid and satisfactory method for the detection of damaging defects which has been devised." But he also emphasized that "The great sensitiveness of the method requires that its application and interpretation be supervised by personnel with experience in engineering and metallurgy."

From the lively discussion of the magnaflux method that followed, it was apparent that not everyone had had happy results with the magnaflux inspection system; the point made by both authors was emphasized – that experienced operators are an essential part of the system. In a prepared discussion submitted by C. E. Carrigan, of the Ranger Engineering Corp., a number of examples of wrong indications were given, as in the case of an indication on a valve ring-groove which was found to result from the ring being magnetic due to welding on the Stellite tip, which caused a physical change in the material at that point. Frank W. Caldwell, of Hamilton Standard Propellers, praised the advances being made in supply of more nearly flawless basic materials through the help of the steel makers. W. Lavern Howland, of California Institute of Technology, was surprised that neither paper had mentioned the X-ray method of inspection, which was the only way of revealing internal flaws and flaws in parts made of non-magnetic metals. C. J. Nyquist, of the Magnaflux Corp., agreed that the X-ray was a valuable method for sub-surface inspection and thought the two processes complemented each other, although he feels that magnaflux is superior for the rapid production inspection of large quantities of small parts. W. C. Deeds, of Douglas Aircraft Co., gave an interesting example of an expensive type of imperfection in forged parts that became discernible only after extensive machining and which the magnaflux method did not reveal in the rough forgings. C. E. Stryker of Bendix Aviation asked whether a light flash cadmium plating of rough parts would not reveal flaws, and Dr. Klein reminded him that this point was covered in the Laudan, Minshall and Ball paper which had been presented at the 1936 SAE National Aircraft Production Meeting and later won the Wright Brothers Medal.

Method of Cost Reduction

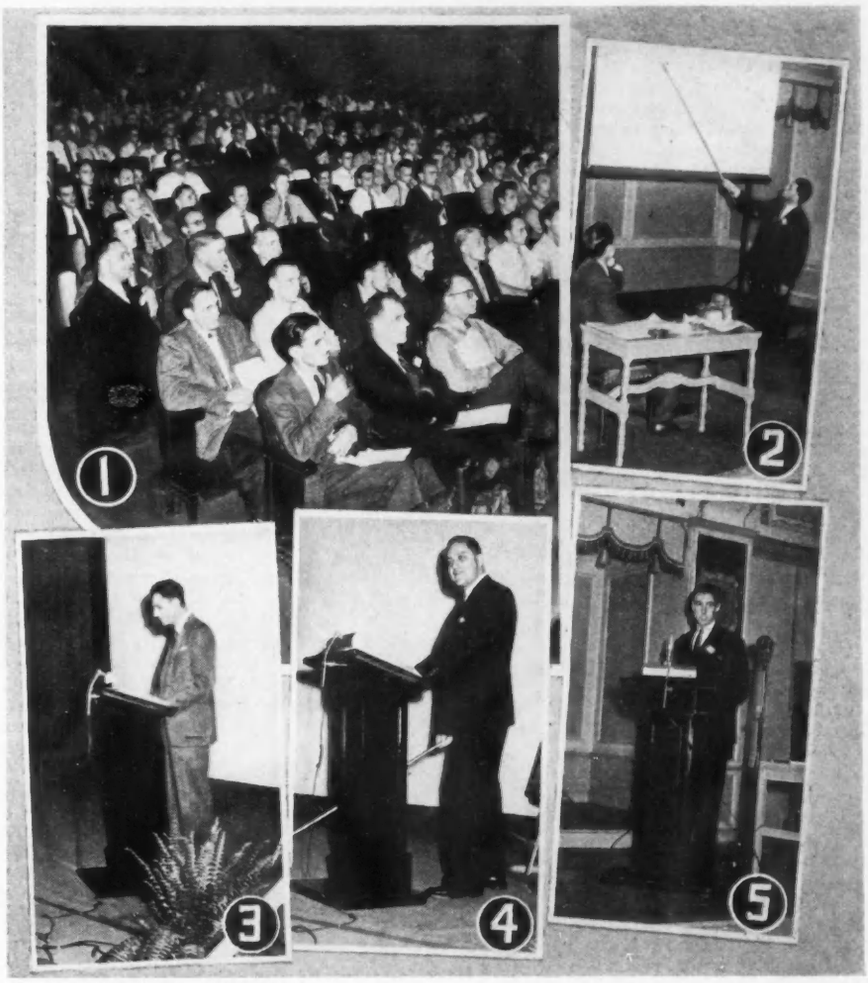
Howard D. Houghton, of Douglas Aircraft Co., served as chairman of the Friday morning session. Harvey C. Christen presented the first paper on "Influence of Design on Cost" in which he told of the work being done at the Lockheed Aircraft Co. to reduce costs through production engineering as a separate activity apart from, though correlated with, design engineering. Production engineering, he pointed out, requires men of engineering knowledge but with shop training. "Production engineering's principal connection with design is to analyze and check all design for conformance to existing modern production methods prior to release for process, fabrication, or assembly," he asserted. Through adaptation of the Continental die process for certain cutting operations the cost of layout for some parts had been reduced from 75 cents to as low as 3 cents per unit, he announced. Mr. Christen defined this process as a blanking operation requiring no special die shoes or holders. Aluminum-alloy router equipment is another major step in production economy now being used in one form or another by almost every aircraft factory in this Country, he declared. The metal router, he explained, is a direct adaptation of the familiar wood router, the work being passed around a shaper head. By this method the operator can cut as many as 480 lineal ft. a day of laminated 0.020 stock (15 sheets – 7/16-in. thick). In many cases work of the production-engineering department has resulted in direct structural or other engineering gains, in addition to achieving desired economies, he pointed out. Production engineering studies had made possible, in some cases, relaxation of tolerances without penalizing serviceability of the product, Mr. Christen announced.

In discussion Peter F. Rossmann, of Curtiss Aeroplane Division, Curtiss-Wright Corp., remarked that wider tolerances, which might be all right for production purposes, might not be satisfactory for maintenance, especially as to interchangeability. He also feels that the designer should not be hampered by considerations of production cost, but must be free to design parts from as nearly an ideal standpoint as practicable. Mr. Christen agreed, saying that the Lockheed designers were not restricted, but only guided to consider production costs as well as other factors. T. P. Wright, Curtiss-Wright Corp., commented that the process of fastening parts required more labor time than cutting and forming, and that production engineering should be concentrated on these fastening operations, such as high riveting costs. Dr. Klein seconded this view but went further and said that the entire structure of an airplane represents but a small fraction of the total cost of the airplane, a larger share being made up of sub-assemblies and installations. He feels that production engineers should concentrate on such matters as plumbing, control systems, and so on.

Delivering his paper with refreshing informality, A. H. Leak, of Wright Aeronautical Corp., discussed "Coordinating Engine Design and Production." He finds a great need for improvement in production drawings, greater standardization of such drawings, and special attention to specifying all tolerances on the drawing.

F. M. Cole, of Curtiss-Wright Technical Institute, asked why Nitralloy products had not been adopted more widely for aircraft-engine use. Mr. Leak replied that, in his experience, such parts had not been satisfactory for all applications, although they were being used for cylinder-walls, certain gears, and knuckle pins. In response to a question from Dr. Ab-

Aircraft Production Meeting Speakers



Photos by Charles F. McReynolds

1. Part of the crowd. *In the front row:* F. R. Shanley, General Chairman Carleton E. Stryker and Robert J. Pritchard

2. Dr. Ernest J. Abbott illustrates a point; Session Chairman R. W. Palmer is interested

3. Howard C. Stroup pinch hits and reads V. W. Whitmer's paper

4. Frederick C. Pyne presents his opening-session paper

5. G. P. Thorn reads paper by Bishop Clements

bott, Mr. Leak stated that the Profilometer had proved most helpful in connection with production control, but that his company was not yet ready to place required Profilometer readings on drawings to control surface finish, just as grain flow for forgings was not specified on drawings.

At the Friday afternoon session, with J. L. Atwood of North American Aviation, Inc., as chairman, the manifold contributions of accessories to increased flight safety were outlined in a paper: "Accessories and Flying Aids Contributing to Safety of Operation" by R. P. Lansing in collaboration with C. I. MacNeil, both of Eclipse Aviation Corp., which was read by G. S. Hausamann of that firm. After outlining the aid to flight of recent radio developments, navigation instruments, the Sperry Gyropilot, full-feathering propeller, and other aids now in common use, the author predicted: removal of all accessories from the engine except those essential to operation of the engine itself; extension of servo power applications; general use of automatic landing systems; detecting devices to prevent collisions in mid air; and other extensions of the present work in developing flight accessories.

W. P. Hilliard, of Bendix Radio, described in some detail the Bendix instrument-landing system now being tested by United Air Lines and soon to be in use at a number of terminals.

C.F.R. Progress Report

A paper entitled "Investigation of Vapor Lock in Aviation Fuel Systems, C.F.R. Progress Report" by Dr. O. C. Bridgeman, National Bureau of Standards, was read by C. B. Veal, SAE research manager. Describing in detail the C.F.R. work to date, promise was given of early solution of aircraft vapor-lock problems, and of practical use of fuels of higher vapor pressure. Mr. Atwood read prepared discussion submitted by R. D. Kelly of United Air Lines, in which he commented that air lines have specialized fuel problems all of which they have solved with complete satisfaction, although advent of substratosphere planes probably will bring new problems for solution. C. C. Moore of the Union Oil Co., expressed the opinion that aircraft engineers are back in the horse-and-buggy days so far as fuels are concerned. Mr. Moore believes that engines should be designed to use fuels with vapor pressures double those now in use. A similar thought was expressed by Mr. Oberfell, of the Phillips Petroleum Co., in prepared discussion read by the chairman. A letter from Gaylord W. Newton, Civil Aeronautics Authority, was read, asking how the C.F.R. information would be made available to the industry and how soon. Mr. Veal replied that the work must be successfully finished first in any case, that they were trying to walk first and then run so far as using fuels of higher vapor pressures are concerned, but that a C.F.R. report eventually would be made available to the industry.

Hall L. Hibbard, Lockheed Aircraft Co., presided over the lively Friday evening session. A paper was presented on "Safety in Air Transportation" by J. A. Herlihy, of United Air Lines. He listed the things which have been done, and which still need doing, particularly from an engineering standpoint, to secure the perfectly safe airplane. Dr. Klein contended there is no such thing as a perfectly safe plane, as safety devices are never used as such, but are simply used to extend a plane's operating limits into territory not previously entered. In reply to a question from Mr. Stryker, Mr. Herlihy said that high wing loadings are necessary and probably will be continued. Mr. Cole asked if carbon-pile vibration pickups indicate the planes in which vibrations take place. Elmer P. Wheaton, of the Douglas Aircraft Co., replied that his firm has designed successfully and used all manner of carbon-pile vibration pickups to show vibration in any plane, or torque vibration. Kirk Green, of Aero Institute of Technology, wondered if the figure of passenger miles flown per fatality is a good statistic for public consumption. Mr. Herlihy replied that it is at least a yardstick to tell where we are going safety-wise. Mr. Shanley contended we are thinking backwards as to safety and should really list accidents per mile rather than miles per accident. Mr. Wright added that we should stress the fact that insurance rates for air travel are the same as for rail travel.

Describing the new Dubl-Chek instrument board to be installed on the Curtiss-Wright 20 transport now under construction, A. E. Lombard, Jr., of that company, discussed "Designing for Safety." He concluded that safety must be reached through improvement of equipment inasmuch as pilots are already as nearly perfect as we can ever expect them to be. To accomplish this purpose the Curtiss-Wright 20 will simplify instrument-board supervision through the Dubl-Chek board which segregates instrument functions by flight category such as "starting engines," "take-off," "climb," "cruising," "landing," and so on, he explained. By simply pressing a button, the pilot will get an indication if anything is wrong, such as insufficient fuel supply, or that the landing gear is up when it should be down. In response to an objection from Dr. Klein that the lights on the Dubl-Chek board might burn out just when they are needed, Mr. Wright stated that the Dubl-Chek board checks itself and gives the pilot a warning when a light burns out. In response to Richard M. Mock, Fokker Aircraft Corp., Mr. Lombard outlined the system of booster power that will be used to help the pilot manipulate the controls on the Curtiss-Wright 20, a transport plane in the same size range as the Douglas DC-4.

The final session on Saturday morning was supervised by E. H. Heineman, Douglas Aircraft Co. Jerome Lederer, Aero Insurance Underwriters, stressed the fact in his paper "Notes on Loss Prevention in Civil Aviation" that a large part of the aviation insurance losses are not from accidents, but from such causes as fire and wind storm. Presenting comprehensive tables of accident experience, he showed that accidents per mile in miscellaneous flying decrease as the number of planes in service increase. He found serious fault with present student instruction methods and reported a program under way to educate better the instructors who give flight training. Commenting on the use of fire extinguishers with gasoline fires Dr. Klein said that certain extinguishers can develop phosgene gas, a deadly poison, and others will develop carbon dioxide and bring about asphyxiation if in a closed place. Mr. Mock told of completely flame-proofed cabins on all Douglas DC-3 planes exported to Europe, and at no increase in weight. Mr. Stryker found Mr. Lederer's talk quite discouraging from the engineering standpoint as he believes that the facts indicate rather clearly that personnel error is the major accident cause and, even if a perfectly safe airplane were built, the accident rate would remain about the same due to the human element which would do foolish things. C. F. Lienesch stressed the need of broad pilot education to achieve safety, rather than through any new engineering, or regulation.

Mechanical Failures Reviewed

In the final paper of the session, Stephen Rolle, of the C.A.A., read a paper prepared by Gaylord W. Newton, Civil Aeronautics Authority: "A Survey of Mechanical Failures of Aircraft During 1936-37" which proved to be a valuable compilation from a statistical standpoint. Wallace M. Fairfield, of Fafnir Bearing Co., suggested that accessory people contact service bases regularly to learn of special problems which may bear on accidents. Dr. Klein remarked that we need more complete engine-failure report forms in order to determine the exact nature of failures. A. A. Mathewson, Solar Aircraft Co., suggested that photographs should accompany failure reports. Ivor Shogran, of Douglas Aircraft Co., believes that free-hand sketches accompanying reports would be a big help. Mr. Stryker sees need for such an annual safety report as this at each annual engineering conference in order to show engineers what progress they are making.

Tulsa F. & L. Meeting

(*Continued from page* 11)

A Rotameter flow meter on the dynamometer, calibrated to tenths of gallons per hour, permits easy calculation of miles per gallon, by dividing miles per hour by gallons per hour, without the time and expense of consuming a measured quantity of fuel.

Use of the dynamometer permits the operator to determine all the controlling factors while working alongside the engine and enables him to make adjustments instantly at any speeds.

Operating a fleet of more than 400 cars and trucks, R. J. Collins, Kansas City Power and Light Co., finds that every economic and engineering condition must be known, controlled and kept at standard if efficient operation is to be expected. He has found that fleet passenger cars can be operated at three to eight cents per mile. Truck costs often run very high, a cable-puller costing his company 85 cents per mile operating downtown, a part of which was idle-time cost.

His total operating expense in 1937 was 11.0 cents per mile, the lowest in his records. Operating cost alone, excluding overhead, was 6.4 cents per mile, with maintenance slightly over one cent, and gasoline figuring about 0.9 cents per mile using 70 octane number fuel entirely. The use of an oil reclaiming unit has given a satisfactory product at considerable lubrication cost reduction, exact figures for which were not given. Collins complimented manufacturers in saying that the progress made in equipment design and construction had simplified the operators' troubles; road failures are becoming very infrequent. Improvements made by lubricant makers in their products, and the increasingly active cooperation between the SAE and other technical organizations is rapidly advancing the entire automotive industry, he is certain.

Hardly less important in the oil industry than the operation of transportation equipment is the design, operation and maintenance of drilling and pumping powerplants. The time-honored pump engine is a horizontal single-cylinder engine, operating generally on natural gas from the wells it pumps or from other nearby sources. Balancing all economic factors of the two types of engines available, the multi-cylinder engine is frequently found to be the more profitable type of pumping power, L. W. Johnson, Stanolind Oil & Gas Co., showed.

While not adaptable universally to field operations, this application of the multicylinder engine is shown to be successful by the increase in the number of installations of such power units in the pumping field. Installation costs range at about $70 per horsepower for multiple-cylinder units, as compared to about $80 for the single-cylinder engine, Johnson reported. Multiple-cylinder engines may have shorter lives than the specially designed two-cycle engines, but the installed cost is only about half as much for the multiple cylinders as for the two-cycle types. In addition to well pumping, the multiple-cylinder types are being applied widely to drilling, compressor power, electric power generation and pipeline pumping.

Special consideration of design features is necessary to make the multicylinder engine more efficient and applicable to oil field uses. Radi-

ator cooling systems must have ample capacity, and be designed to facilitate cleaning. Clutches must be simple and rugged enough to stand the widely varying loads in pumping. Carburetors must be made simple and rugged, as must ignition systems, so that field operators can repair, adjust and replace them easily under conditions where little if any facilities for this work are available, and where operators frequently are not technically trained. Engine bases must also be rugged and suitable, for example, for use on slide rails.

The design features of primary importance, which must be solved satisfactorily to make these engines desirable, are the use of valve seat inserts, premium quality valves, more ample lubrication capacities to avoid frequent replenishment of oil, cylinder liners to permit reconditioning the engine at its place of operation or at a minimum of delay and cost, precision type replaceable bearings. All these factors affect preponderantly the servicing, the life and the field efficiency of the powerplant, which in most cases is located far away from shops and properly trained personnel, where stoppage of operation is costly, and substitution of engines for considerable periods is a decided disadvantage.

One serious error is to adopt engines for pump service on the basis of average loads. Rather the power chosen should be high enough to meet peak load demands; much of the field troubles are traceable to too low power in the engines installed, the lower power for average load being used to reduce engine cost.

Gas-Engine Problems

Engines for operation on gas are furnished with higher compression ratio than those for use with gasoline fuels, operators state. On natural gas a b.m.e.p. of 100 lb. or higher may be used. One local problem especially in West Texas is the use of gas containing sometimes as much as 12 per cent of hydrogen sulfide. Chemical treatment does not remove all the corrosion, which soon attacks copper tubing, electrical equipment, oil lines and bearings, which latter are especially susceptible.

Again, cooling radiators give trouble if not easily cleanable since much of the water is heavily impregnated and deposits high quantities of scale. Dust storms are prevalent during certain seasons. Therefore, oil and air cleaners are indispensable if repair costs are to be held down, and if engine life is to be long enough to be profitable. Most engines now are offered with oil-bath type air cleaners.

One of the greatest advantages of the Diesel engine in automotive and other applications is its higher efficiency at part-loads, it was pointed out in a round-table discussion of the progress of Diesel power. Diesel engines in 36-passenger buses in the East, for example, go from stop to 10 m.p.h. in 2½ sec., and up to 40 m.p.h. in 10 sec., it was reported.

Students Debate Merit Of Rear-Engine Mounting

Following the practice established at the F. & L. Meeting three years ago, a debate was held, between teams from Kansas State College and the University of Oklahoma on the subject, "Resolved: That Rear Engine Mounting is More Desirable Than Forward Engine Mounting for Passenger Cars." A panel of five judges awarded the decision unanimously to University of Oklahoma, which took the negative side.

The competing debaters were rewarded with student memberships in the SAE, including subscriptions to the Journal, an action which elicited the greatest appreciation from these students.

The competing students were: Kansas State College, Leroy Culbertson, John McKenna and John Pennington; University of Oklahoma, Silas Gassett, James Billings and John Riley.

The cetane number method of determining fuel-ignition quality is not yet entirely satisfactory, since it may be repeating some of our earlier experience with octane number testing of gasolines. Agreement of laboratory results with road ratings must be improved, but it is expected that this will be a simpler problem with Diesel than it has been with motor fuels.

Little if any need exists for cetane number fuels higher than 60. The new General Motors 2-cycle engine is stated not to be "finicky" about ignition quality of its fuels. Fuels of 50 cetane number show good operating results, and 50 is considered a good standard of quality, the discussers of the subject generally agreed. To go to much higher compression ratios than the generally used 16:1 to obtain the greater efficiency of higher cetane numbers introduces other difficulties, especially mechanical and design problems, which militate against our taking advantage of the higher fuel efficiency.

Revision of the term "extreme-pressure lubrication" to read "extreme temperature and pressure lubrication" is proposed by H. Blok of the Royal Dutch Shell Research Laboratory at Delft, Holland. In this laboratory, research with the so-called "Four Ball Apparatus" has shown that the local temperature at the point of contact is the governing factor in permitting or preventing seizure, and not the specific local pressure, as has been believed. In a paper prepared for this meeting, presented by T. B. Rendel, head of Shell's automotive research laboratory at Wood River, Ill., the method for determining the "seizure delay" period of what is called "E.T.P." lubricants.

This seizure delay period determines the load which may be placed on the apparatus before incipient seizure occurs within 2½ sec. after the test is started. Briefly the apparatus consists of three ball bearings clamped immovably in a bowl and submerged in the lubricant to be tested. A fourth ball is clamped in a chuck driven by a 1½-hp. motor, the fourth ball resting pyramidally on the three balls in the bowl. The load on the ball contacts is applied by a weight lever resting against the bottom of the bowl, and loads from 22 to 1770 lb. may be used.

The load is applied to the balls, and the motor turns the fourth ball, reaching a speed of 1450-1500 r.p.m. in a few tenths of a second after starting. A series of one-minute tests are carried out on the lubricant, with increasing loads, until a load is reached which produces incipient seizure within the allotted 2½ sec. of time. The load at which the seizure delay amounts to 2½ sec. is read from the averaged seizure delay curves, and is taken as the measure of the protection against seizure afforded by the lubricant.

Practically no correlation has been shown between the results of this "Four Ball Test" and results from the Timken, SAE and other test methods. Better correlation between these test results and those obtained with commercial hypoid gears is found, hypoid-gear tests not being accurate enough for good correlation. The main inherent advantages are claimed to be: test results have a direct bearing on E.T.P. lubrication practice; E.T.P. lubricants much more powerful than those now used can also be evaluated; reproducibility is very satisfactory; test pieces are inexpensive and commercially available in any quantity; starting time of test is short; only a small quantity of lubricant is required.

New Chairman Presides At Student Branch Meeting

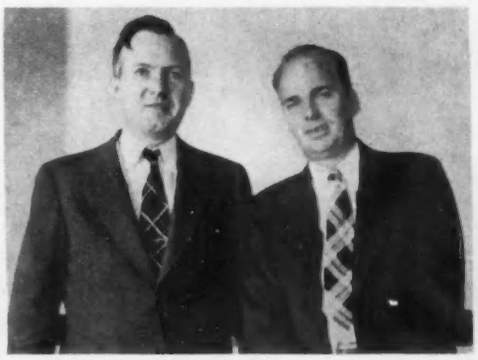
● Oregon State

At its first meeting of the school year, Sept. 27, the Oregon State College Student Branch discussed programs for forthcoming meetings and planned membership activities. The new chairman, Harold W. Ager, Jr., presided and introduced the other new officers; Mark Patterson, vice-chairman, and R. Jack Brun, secretary-treasurer.

Snapped at Tulsa F. & L. Meeting

Frank A. Suess
Dinner Chairman

T. J. Schuetz
Session Chairman



Dr. C. W. Rippie and Dr. R. T. Leslie

C. A. Tangner
Committeeman

Chicago T. B. & R. Meeting

(*Continued from page* 12)

Weber's contentions with figures on their own Diesel runs.

A. R. Walker, electrical engineer, equipment, Illinois Central, spoke of the Diesel for switching work. He said that his road has been using Diesel switchers since 1929 and had found that, besides having higher availability than steam engines, the Diesels save about $1.50 per hr. of operation.

How the North Western-Union Pacific "City of Portland" is able to be in continuous service between Chicago and Portland, 4700 miles round trip, with an availability of better than 90 per cent was told by C. B. Cotton, supervisor, motor equipment, of Chicago & North Western. It would take eight steam locomotives to handle this run on the same schedule, he declared.

The Santa Fe's Diesel-powered "Super Chief" has covered some 300,000 miles in a little over one year, and has not yet been late in arriving at either terminal because of engine trouble, L. W. Goodrich, Santa Fe master mechanic, stated. He urged development of better suspension bearings for the traction motors and, in the heating plant, better material for coils, a more durable fire pot, and more reliable safety devices to protect the boiler from overheating.

Continuing the discussion, R. M. Dilworth, chief engineer, Electro-Motive Corp., briefly explained why two-cycle Diesel engines have been satisfactorily developed for railroad use. Usually, he said, two-cycle engines are developed to meet the engine salesman's demand for a lighter engine at a lower cost. In building for the railroads the objective was not to meet a salesman's dream but to build an engine large enough to pull a train but small enough to put on wheels and get through tunnels.

Larry Wilcox of Westinghouse Air Brake Co. declared that trying to stop trains going at 100 m.p.h. has given the brake man plenty of headaches – and that he is not over with them yet. He said that we now have an entirely new form of passenger-car brakes developed for both Diesel and other high-speed trains and that, from present indications, we may expect radical changes in braking within the next few years.

Ernest Kuehn of Electro-Motive gave a brief history of the development of his company and told members and guests of the Society things to watch for on the afternoon trip to the Electro-Motive plant.

Well over 200 took advantage of the opportunity to go through the Electro-Motive plant, devoted exclusively to the building of internal-combustion engines for rail use. After a complete tour of the plant, the company showed moving pictures illustrating the principles of the two-cycle Diesel engine and showing Diesel-electric locomotives in operation, pulling high-speed passenger trains and operating as switchers in yards.

Exactly 150 attended the dinner Tuesday night. General Chairman Edward A. Sipp presided for the first part of the program, introducing those at the speakers' table and conveying the Chicago Section's greetings. Section-Chairman D. E. Gamble, when introduced, read a telegram from SAE President C. W. Spicer expressing his good wishes for a successful meeting. Council Member Fred L. Faulkner spoke of the meeting as the first tangible evidence of President Spicer's wish for closer cooperation between the railroad and automotive engineers.

Presiding at the technical session, W. K. Creson, meetings chairman of the Truck, Bus and Railcar Activity Committee, began by reading a message expressing the regret of H. E. Simi, vice-president of the Society representing the Activity, at being unable to attend. He then introduced Walter E. Dunham, speaker of the evening.

Rail and Automotive Men Meet at Chicago

Photos by Frank P. Bennett of Chek-Chart

1. W. K. Creson, *Ross Gear & Tool Co.*, dinner chairman, and Chicago Section Chairman D. E. Gamble, *The Borg & Beck Division, Borg-Warner Corp.*

2. A. R. Walker, *Illinois Central System*, chairman of the Wednesday morning session, and Frank Murphy, *Pullman-Standard Car Manufacturing Co.*

3. P. K. Kass and G. S. Goodwin, *Chicago, Rock Island & Pacific Railway*, and Ernest Kuehn, *Electro-Motive Corp.*, who arranged the plant visit

4. William H. Hubner, *Universal Oil Products Co.*, chairman of the opening session, with speaker E. F. Weber, *Burlington Lines*

5. Harry Bryan, *International Harvester Co.*, past-chairman of the Chicago Section

6. F. L. Faulkner, *Armour & Co.*, SAE Transportation & Maintenance Activity vice-president, and Edward A. Sipp, *Burgess Battery Corp.*, general chairman of the meeting

Weight Reduced 50 Per Cent

Although the development of aluminum alloys and high-tensile steels has enabled the construction of passenger-car shells weighing, in some instances, almost 50 per cent less than shells of former steel cars; bigger brakes, air-conditioning apparatus, larger and heavier electric equipment to supply current for lights, radios, etc., have brought the weight of the complete modern car to approximately 75 per cent of the former car, Mr. Dunham, who is general superintendent, car department, Chicago & North Western Railway Co., stated in opening his paper, "The Transportation Container."

The newer light-weight materials have not been available long enough to determine their service life, a matter of great interest to the engineering profession, he said. He noted that on many passenger cars built over ten years ago, aluminum sheets are still in perfect condition and show no sign of deterioration. The stainless steels and high-tensile steels, he added, have been available for only about six or seven years.

The speaker called attention to the fact that some finished cars are all-welded, others all-riveted and still others have been assembled with both welding and riveting. Each special material and method of construction has merit, he believes, and the selection of one or the other is a matter for special study in each case.

The effort to have the entire train fully streamlined from front to rear by articulation and closure or covering of the connections between units has not been entirely satisfactory from either maintenance or operating standpoints, Mr. Dunham revealed. In the former case, he explained, special terminal or shop handling of the whole train may be involved because of a simple maintenance requirement of one unit, and in the latter the capacity to increase or decrease the number of cars in the train has its traffic and operating difficulties. In recent construction, he said, the use of articulation has been restricted to a maximum of three units, usually two, and then only when the units must and can be operated together, such as the kitchen-diner combination.

Proposed Constitutional Amendments Go to Members

In compliance with paragraph 57 of the Society's Constitution, the proposed amendments to paragraphs C-5, C-6, C-14, C-24, C-29, C-30, C-34, C-35, C-39, C-41 and C-46 will be mailed to the voting members of the Society shortly. These amendments provide that Service Members be granted voting and office-holding privileges.

At the 1939 Annual Meeting the amendments will be presented for discussion and final amendment and subsequent to the meeting shall be submitted by letter ballot to all members entitled to vote, provided that 20 votes are cast in favor of such submission.

"Seven years ago such terms as relative humidity, air motion, B.t.u. and Freon were a foreign language to the railroad man," L. J. Verbarg, air-conditioning engineer, Missouri Pacific Lines, told those attending the Tuesday morning session in his paper, "Air Conditioning of Buses, Railcars and Coaches."

Remarking that he had often been asked which air-conditioning equipment is best suited for railway work, he stated: "'There just ain't no such animal.' There are too many widely varying conditions to permit setting up an equation that would answer this question. The more important of these conditions are: 1. The geographical location of the territory in which the vehicle is to operate; 2. The maximum, minimum, and mean temperatures prevailing at that locality both night and day during the heating and cooling seasons; 3. The length of the heating and cooling seasons; 4. The length of the run and the number, frequency and duration of stops."

Mr. Verbarg advocated the development of a standard for determining operating costs of air-conditioning equipment and stressed the importance of preventive maintenance with fixed schedules covering inspections and work to be done at the end of each trip, at semi-monthly, monthly, and annual intervals. He likewise spoke of the necessity of considering accessibility when installing equipment. "Make it difficult to get to and tiresome to work on," he said, "and no maintenance will be the result."

Before closing, Mr. Verbarg warned designers of equipment not to stint on the fresh air supply, stating that 30 to 35 per cent is not too much.

That air conditioning is still far from perfect for railroad cars and even further from perfect for automotive buses was evident from the discussion which was presided over by A. R. Walker of Illinois Central.

L. A. Richardson, engineer, Rock Island Lines, emphasized the difficulty of keeping cars with a system designed to meet conditions of one run on that run because, when traffic shifts, the passenger department does not inquire into the air-conditioning system of a car before shifting it. He indicated that a system ultimately will be developed that will meet the requirements of all sections of the country.

Regarding accessibility, Mr. Richardson vigorously seconded the speaker's remarks. He told of one instance where it required five hours to get to a job and five minutes to fix it.

"Don't mix equipment," was the advice of D. F. Carter, assistant electrical engineer, Burlington Lines. If you do, maintenance problems multiply and the keeping and transfer of parts is difficult, he said.

Another discusser, R. I. Fort, mechanical inspector, Illinois Central, brought up the problem of air-conditioning of mixed-train cars that operate in out-of-the-way sections. Regarding direct-mechanical systems he said that it is necessary to provide standby facilities, even at some way stations where trains stop for mechanical service, and that this practice is costly.

Answering a question by W. A. Damerel, Burgess Battery Co., Mr. Verbarg stressed the necessity of providing agreeable relative humidity, particularly when heating the car. The average present-day humidity control, he said, has too much time lag and the passenger gets the feeling of being first too hot and then too cold although the temperature varies only one or two degrees.

It was brought out by Mr. Walker that with better humidity control it will be possible to get away with smaller differences in temperature between the inside and outside of the car, thus making the passenger comfortable and saving him from too severe a shock when boarding or leaving an air-conditioned car.

J. E. Gardner, electrical engineer of Burlington Lines, expressed his belief that filtering of the air needs more study.

C. E. Wood, engineer, train lighting, C. M. St. P. & P. Ry., believes that the future may see a special power car to take care of all the train's requirements other than motive power.

Answering a question put by D. D. Alton, special engineer, Southern Pacific Lines, Mr. Verbarg stated that better control could be had by using two separate air-conditioning units of half the present cooling capacity on each car, but that this arrangement is now impractical

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because of double installation and maintenance costs.

Lack of room makes it particularly difficult to properly air-condition a bus, maintained A. E. Voight, Santa Fe, who stated that low ceilings make for spotty distribution. Unless there are arrangements for carrying return air through ducts, he said, there is bound to be a draft at about the passengers' head level.

Despite the fact that the closing session of the meeting had to compete with the opening game of the World Series, attendance was excellent. Session Chairman W. A. Parrish not only introduced the speakers and discussers but also announced the score of the game at auspicious moments.

Waukesha Motor Co.'s vice-president, James B. Fisher, led off the program with his paper "Comparison of Diesel, Hesselman, and Gas Power."

He summed up his technical analysis of these three types of engines with the following tabulation:

Gasoline Engine

Advantages	Disadvantages
Lightness.	Poor fuel economy.
Easy starting.	Uses expensive fuels.
Low pressure.	Requires ignition system.
Low maintenance cost.	
Definite time of ignition.	
No change to use gaseous fuels.	
No shock loads on power transmission units.	

Diesel Engine

Advantages	Disadvantages
Excellent fuel economy.	Heavy construction.
Uses cheap fuels.	Hard starting.
Requires no ignition system.	High pressure.
	High maintenance costs.
	Fuel sensitivity.
	Change of compression necessary to use gaseous fuels.
	Shock loads on power transmission units.

Hesselman Engine

Advantages	Disadvantages
Good fuel economy.	Gasoline starting.
Uses cheap fuel.	Requires ignition system.
Lightness.	
Easy starting.	
Low pressure.	
Low maintenance costs.	
Definite time of ignition.	
No change for gaseous fuels.	
No shock loads on power transmission units.	

Mr. Fisher closed his paper with a demonstration which showed clearly how the introduction of rotary turbulence speeds ignition.

Diesel men were prompt to answer the call for discussion. A. K. Antonsen, John Deere Tractor Co., traced the strides made by the Diesel engine and expressed his belief that present-day defects will be eliminated. T. M. Robie of Fairbanks-Morse called the speaker's attention to the fact that the high-speed Diesel is a comparatively recent development and that experience with fuels for these engines has been limited. He thinks it possible that some additive will be developed for Diesel fuel that will overcome the ignition lag now being experienced. That work in this direction is being done was related by George A. Boyd who told of steps taken by his company, the Sharples Solvents Co., along these lines. W. H. Hubner, Universal Oil Products Co., noted that most oil companies are working on Diesel dopes.

C. M. Larson called Diesel manufacturers to task for originally selling their engines to run on almost anything and noted that most fuel specifications of Diesel manufacturers are obsolete. He also explained the present problems in distribution of Diesel fuels in the various sections of the country.

Answering a question by J. G. Oetzel, Fairbanks-Morse & Co., Mr. Fisher stated that the Hesselman engine has little or no exhaust odor, because ignition occurs considerably before top dead-center and the fuel is more completely burned than in the Diesel.

The temperature, the humidity, the purity, and the movement of air are factors which must be controlled simultaneously and constantly to provide truly conditioned air, declared Ralph Leadbetter, chief of research, C. F. Burgess Laboratories, Inc., in his paper "Evolution of Air Distribution in Ventilating Systems," read by W. A. Damerel of the same organization.

The requirements of perfect air distribution are to conduct heat and moisture either to or away from a passenger, to provide him with fresh air, and to do these two things without causing him any personal discomfort, he explained.

This can be done, he noted, if air is brought into the enclosed space and distributed to all parts of the space at velocities not exceeding 40 ft. per min., and if the temperature between any two points in the space does not differ more than two or three degrees.

In discussion E. P. Marsh, Chicago & North Western, told of his company's experience in air distribution. He particularly emphasized the necessity of keeping the air clean and noted that, on the newer high-speed equipment, a problem has developed requiring a sealing, particularly of the bottom of the cars, in a manner hitherto unheard of, because of a pressure developed between the road-bed and the bottom of the car which drives dust through the smallest of crevices. This fine dust plus the normal dust from carpets and upholstery, he said, is putting the recirculated-air filters to a task not planned for. He concluded by noting that, although we have come a long way in making travel more comfortable through air conditioning, "we don't want to kid ourselves into believing that there are not a lot more bugs to work out, and one of them is to provide cleaner air."

135 Hear Benninghoff's Paper on Tocco Process

● Indiana

With 135 on hand, including some two-score out-of-state members who drove 70 miles to attend, W. E. Benninghoff, of the Ohio Crankshaft Co., addressed the Oct. 13 meeting of the Indiana Section on "The Tocco Process of Hardening and Late Developments." Other speakers were Past SAE President Ralph R. Teetor, who spoke on Indiana Section activity and E. F. Lowe, assistant general manager of the Society, who told of activities of other Sections which he had visited recently.

Mr. Benninghoff's paper was accompanied by a series of slides on the Tocco process, including some illustrations of recent applications in mid-western plants.

Ideas in Zinc

The versatility of die castings in achieving functional details is being appreciated more and more by automotive engineers. It is important, also, to realize that the die casting process offers unusual economies when used in small quantities as well as in mass production.

Look at the diesel engine industry. Heart of the modern high speed diesel engine is the fuel injection system, only in recent years produced for use by American manufacturers. The Diesel Equipment Corporation recently announced a complete fuel injection system for general use, embodying a number of interesting zinc alloy die castings.

Three principal die castings comprise the fuel transfer pump which is a vital part of the Deco equipment. The major casting is the intricately cored pump body, incorporating two cylinders each formed with a hardened steel liner. These liners are cast as inserts, with provision for positive cooling while in the die to prevent annealing of the hardened sleeve. The other two die castings are the pump valve housing and cover, the latter having a cast-in brass bushing.

By selecting zinc alloy die castings for these important parts, many economies were achieved through the elimination of machining and assembling operations —this in spite of limited production volume. Further, through the use of inserts it was possible to provide special bearing surfaces where needed.

The economies and physical properties of modern zinc alloy die castings can be applied to a wide variety of low production parts through the availability of the high strength, stable Zamak Alloys, based on Horse Head Special Zinc of 99.99+% purity. The New Jersey Zinc Company, 160 Front Street, New York City.

Idea No. 18

Stout Previews Future Trends in Engineering

● **Milwaukee**

Some 100 members and guests of the Milwaukee Section had a preview of the future when William B. Stout, president of Stout Engineering Laboratories and a past-president of the Society, spoke on "Looking Ahead in Engineering" at the Section's Oct. 4 meeting.

Mr. Stout placed particular emphasis on the part played by commercial research in airplane development in the United States and Europe. He also spoke of possible advancements in the fields of land transportation and housing. At the conclusion of his paper Mr. Stout showed moving pictures of some of the projects developed by his company during the past decade.

Section Welcomes National Officers

● **Northwest**

Northwest Section members were hosts to SAE President C. W. Spicer and Secretary and General Manager John A. C. Warner on Sept. 28. The visitors were introduced to the 120 in attendance by Section Chairman Harley W. Drake.

Mr. Spicer addressed the group on "New Firing Lines for Engineers" and Mr. Warner took as his subject, "Truth Through Torture." Dramatic slides accompanied each talk and a colored moving picture was shown of scenes to be visited during the SAE World Automotive Engineering Congress, May 22 to June 8, 1939.

Opening Session Sets First-of-Year Record

● **Canada**

The September dinner meeting of the Canadian Section, held at the Royal York Hotel, Toronto, set a new high for first-of-the-year sessions. There were 125 members and guests present; registering from eight cities in Ontario and Quebec.

Chairman Charles Tilston presided and introduced Walter E. Shively, Goodyear Tire & Rubber Co., speaker of the evening. He also expressed appreciation to the meeting's hosts, the Goodyear Tire & Rubber Co. of Canada, Ltd.

Bad Driving Blamed for High Maintenance Costs

● **Philadelphia**

Twenty-five engineering students of the Drexel Institute of Technology were guests at the first meeting of the Philadelphia Section's 1938-1939 program year, held Oct. 12 at the Engineers Club. B. B. Bachman, vice-president in charge of engineering, Autocar Co., who discussed "Truck Chassis Maintenance," was introduced by J. B. Franks, Jr., White Motor Co.

Mr. Bachman, who expressed his belief that too much importance is attached to the purchase price of a truck, suggested that it should represent only a small part of the sum expended over the period of service. The sum, he says, should include not only the purchase price, but also interest on this price, license fees and taxes, insurance, garage expense, wages, fuel, lubricants, tires, and maintenance. Of these items, maintenance was isolated as the cause for large variation in total cost of operation over the life of the equipment.

"Good or bad maintenance," said the speaker, "starts with the driver. Some of the things which contribute to high costs are: racing engine when starting; letting the engine idle for long periods; racing the engine down hill and using it as a brake; starting under load in too high a gear; backing into curbs; picking up a semi-trailer at too high speed; abuse of brake by making every stop as though it was an emergency; clipping or jumping curbs in making turns; dragging engine at low speed on grades."

Mr. Bachman stressed the importance of keeping equipment clean, saying. "The driver cannot have the same regard for a truck which is allowed to become dirty and the service man cannot make either satisfactory inspection or repairs. Lubrication of a dirty job often does as much harm as neglecting it entirely for in some cases dirt is carried into the part, as in an engine or transmission or rear axle, and in other cases the parts are so sealed off that the lubricant cannot be forced in."

In discussing the paper, Thomas C. Fraser, Standard Oil Co. of Pa., took friendly issue with Mr. Bachman, stating his belief that maintenance begins not with the driver, but with the design of the chassis. Mr. Fraser would like to have engineers responsible for the design of truck chassis take a more receptive attitude toward suggestions made by those experienced in the operation of fleets.

Parrying these remarks, Mr. Bachman said that the manufacturer is always "behind the eight ball in trying to keep up with things." Mr. Franks supported this view by stating that the operators of fleets should recognize that manufacturers must produce a unit which can be used in many types of service and for this reason the trucks in a certain line are not ideally suited to certain individual operating conditions.

Walter F. Whiteman, of William & Harvey Rowland, Inc., entered the discussion with comments on spring camber. He voiced the opinion that if trucks were not restricted on chassis height that lower camber springs could be used.

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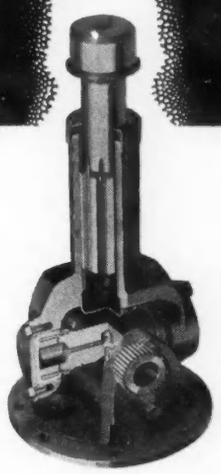

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Spicer, Warner Guests At 'Best-Ever' Meeting

● Oregon

"The best National Officers' Meeting we've ever had!"

Thus did Oregon Section Chairman J. Verne Savage describe the Sept. 30 meeting of the Section, held in honor of SAE President C. W. Spicer and John A. C. Warner, secretary and general manager of the Society.

Mayor Joseph K. Carson, Jr., of Portland, welcomed the two National officers to the city. It was Mr. Spicer's first trip since his election to office.

The guests were the speakers of the evening. Mr. Spicer's subject was "New Firing Lines for Engineers," and Mr. Warner carried his listeners to automotive proving grounds and testing laboratories in his talk, "Truth Through Torture."

The meeting closed with a moving picture showing highlights of the SAE World Engineering Congress to be held May 22-June 8, 1939.

A representative delegation of SAE Student Branch members from Oregon State College, at Corvallis, drove 80 miles to hear President Spicer and General Manager Warner.

Season Opens with 'Get Acquainted Supper'

● Buffalo

Fifty-two members and guests of the Buffalo Section met Oct. 11 to hear C. H. Davis, assistant technical manager, American Brass Co., speak on commercial copper and the effect of impurities on its properties.

Following the technical session a "get acquainted" buffet supper was served, providing members with an opportunity to circulate and really get to know each other over sandwiches and coffee.

About Authors

(*Concluded from page 7*)

sity. After receiving his degree he spent several years in security sales and publicity before returning to Purdue's Engineering Experimental Station as carburetion assistant. He became active in aviation in 1924 as service test engineer and later as assistant mechanical engineer, aircraft powerplants, United States Engineering Division, Air Service, at Dayton. In 1929 he joined the staff of General Motors Research Laboratories and in 1930 returned to Dayton as research engineer, United States Army Air Corps, Wright Field.

● P. A. Collins *first became associated with the automotive industry in 1915 when he joined the Reo Motor Car Co. During his 13 years with that organization he was experimental engineer, technical sales manager, Chicago branch service manager and special representative for the service and engineering departments. In 1928 he left Reo to become sales engineer for the Bendix Brake Co. Two years later he joined the General Motors Corp. as sales manager of the Muncie Products Division; transferring to the Olds Motor Works in 1931. There he was in charge of experimental engineering. He took his present position as experimental engineer of the Chevrolet Division in February of 1934.*

● J. M. Crawford *(M '13), who was a member of the 1934-1935 SAE Council and vice-president of the Society representing the Passenger-Car Activity in 1933, began his automotive career in 1907 as assistant engineer in charge of design for the American Motors Co. Five years later he went with Chalmers as design engineer. From 1917 to 1922 he was chief engineer of the Allen Motor Co. and for the next five years held the same position with Auburn. He joined Chevrolet as assistant chief engineer in 1929 and was advanced to chief engineer in 1931.*

● Lewis M. Townsend *sold automobiles for a year after receiving his M.E. degree from Cornell in '34. Early in 1936 he gave that up to join the Wright Aeronautical Corp. as engine observer and tester in the engineering test laboratory. He later was assigned to spark-plug testing and in 1937 was transferred to the engineering department and placed in charge of all types of spark-plug tests. He also has participated in aircraft-engine accessory tests.*

● Austin M. Wolf *(M '11), prior to each automobile show, spends weeks in analyzing the forward steps taken by automotive engineers in developing the new models for SAE Journal readers. He adds his own conclusions and points to trends made evident through his study. Mr. Wolf has twice been chairman of the Metropolitan Section and has served as a member of the SAE Council. In addition to carrying on a general consulting practice, he is automotive consultant and director of standards for New York State.*

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SAE Papers in Digest

HERE are digests of papers presented at various meetings of the Society.

Some of these papers will be printed in full in the SAE JOURNAL.

Mimeographed copies of *all papers received* will be available, until current supplies are exhausted, at a cost of 25 cents per copy to members; and at 50 cents per copy to non-members, plus 2% sales tax on those delivered in New York City. Orders for mimeographed copies must be accompanied by remittance and should be addressed to Sessions Secretary, Society of Automotive Engineers, 29 West 39th St., New York.

National Passenger Car Meeting, Detroit, Mich. March 28-30, 1938

Motor-Car Engines in England – *Alex Taub, Vauxhall Motors, Ltd.* **(Paper published on pages 229-243, Transactions Section, June 1938 issue.)**

An Investigation of Some of the Fundamentals of Supercharging – *Richard B. Sneed, Ethyl Gasoline Corp.*

ALTHOUGH much work has been done in applying supercharging to automotive and commercial-vehicle engines, comparatively few fundamental data covering the effect of supercharging on engine performance are available to designers. The Ethyl Gasoline Corp. instituted a research program designed to yield such data.

The first phase of the work consists of a group of dynamometer tests on an eight-cylinder engine with the air supplied by a separately driven air compressor. The next phase includes a group of dynamometer tests with a supercharger connected to, and driven by, the engine. The third phase consists of tests on the road, the supercharger being driven by the engine.

The paper presents results from the first portion of the program. After a short introduction describing the test equipment and controls, the paper discusses the influence of supercharging and compression ratio on fuel octane-number requirement, power output, economy, exhaust-gas temperature, exhaust-valve temperature, and heat absorbed by the cooling water.

Transmission and Control Development – *S. O. White, Borg-Warner Corp.*

THE history of transmission and control changes is traced through the past ten years, recounting successively the influence of internal gearing, synchronizers, helical gearing, free wheeling, planetary gearing, the automatic overdrive, mechanical gear-shifters, power shifters, manual remote controls, clutch pedal action, automatic clutches, and developments leading toward automatic transmissions.

The indications point to greater use of four-speed transmissions, planetary gearing, automatic action between third and fourth speeds, and manual remote controls. The pedestal and control lever on the floor seem to be on the way out.

Automatic clutches have not yet arrived, and any general use of automatic transmissions seems to be a long way off.

Car Cost Control – *C. E. Bleicher, Chrysler Corp.*

CAR costs originate in the sales division as it is this division which specifies what must be on the car to make it competitive, and the final design and specifications of any car should be passed on by the sales department, the engineering department, the cost or estimating department, and the shop. The estimating department should be permitted to make suggestions on the design of various parts in order to make every saving possible in manufacturing costs. With such cooperation the possibility of the shop asking for changes after the drawings have been released for production is eliminated. Vendors of purchased parts should be asked to make suggestions to cut costs. As a check on vendors' prices of parts and assemblies, the estimating department should make detailed cost estimates of these items.

More can be done in the purchasing department to control costs than in any other department as the material that this department purchases represents about 65 per cent of the entire manufacturing cost of the automobile.

Everything should be done to keep out all engineering changes except those that are absolutely necessary once the car gets into production.

Car cost control should begin with the idea of the car and continue through until the job goes out of production; it depends heavily upon complete cooperation among all divisions and on everyone doing his job.

Riding Comfort Requirements – *Roy W. Brown, Firestone Tire and Rubber Co.*

IN this paper the personnel of the Riding Comfort Research Committee answers ten important questions regarding passenger comfort.

This expressed opinion should be immediately useful to the motor-car development engineer in building comfort conditions into his product in

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The complex factors which enter into riding comfort are presented in a pictorial manner enabling a better conception of the magnitude and significance of each factor. A conception of passenger comfort from a dynamic point of view is presented.

The paper is presented with the thought of supplying a link now missing between the extensive technical research which has been done to date and its practical application.

Recent Developments in Design of Vehicle Suspension Springs and Their Application – ***Tore Franzen, Chrysler Corp.***

THIS paper is limited to a discussion of springs, their application, and a brief mention of cushion springs. Suspension springs are divided into three groups – springs made of steel; springs in which air or other compressible gases are used as a flexible medium; and springs made of rubber or its substitutes.

The analysis indicates that torsion springs are more economical than leaf springs, but that leaf springs are more popular because they can carry other functions than torsional springs. Various types of inserts are discussed among new developments in leaf springs.

Recent developments in air springs, rubber springs, and test machines for cushions are described, and the damping actions of various cushioned constructions are compared.

Notes on Ride Controls and Calibration – ***C. R. Paton, Packard Motor Car Co.*** **(Paper published on pages 313-318, Transactions Section, August 1938 issue.)**

Engineering Memo
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THERMOSTATS

Body and Chassis Development – ***Joseph Ledwinka, Edward G. Budd Mfg. Co.***

IN the first part of this paper problems of body and chassis development are reviewed from the early days of the automobile up to the present, pointing out the lack of cooperation between body and chassis engineers in the early days.

The author predicts that combined body and chassis construction soon will be adopted generally for quantity-production cars, pointing out that almost all new European models are being built in this way. Advantages enumerated for the unit construction include reduction in the number of individual units; maximum stiffness in all directions; elimination of joints and squeaks from former joints between body and frame; faster assembly; and considerable weight saving.

The changes in assembly methods necessitated by the new construction are outlined. It is foreseen that body engineers will have to absorb some of the duties of the chassis engineers when the unit construction is adopted.

Section Papers

So. California – February 11

Automatic Transmissions in Buses – ***C. B. Lindsey, Los Angeles Railway Co.***

THIS paper explains the mechanical construction and operation, and points out the advantages of the "Mono Drive" automatic transmissions installed on 20 new buses of the Los Angeles Railway Corp. and the Los Angeles Motor Coach Co.

It is reported that these automatic transmissions were adopted to meet the need for an improved clutch and transmission both from an operating and a maintenance standpoint after experimenting unsuccessfully with an electric drive and a centrifugal clutch in an effort to solve the problem.

Some Aspects of Recent Streamlined Train Design – ***H. L. Weinberg, Union Pacific Railway.***

THIS paper describes the general arrangement, design, and special features of the new streamliners City of Los Angeles and City of San Francisco that were developed jointly by the Chicago Northwestern, Southern Pacific, and Union Pacific Railroads.

Seventeen units make up each train, and the total train weight, fully loaded including locomotive, is approximately 1300 tons. Sections of the paper are devoted to a detailed discussion of car construction, car trucks, car equipment, locomotive equipment, locomotive construction, locomotive trucks, auxiliary power generator-distribution, and brake equipment.

Canadian – February 16

Recent Developments in Piston-Ring Materials – ***B. A. Yates, McQuay-Norris Mfg. Co.***

THE importance of the material of the piston-ring has too long been relegated to the background as compared with such design factors as ring proportions, ring loadings, circularity, point pressure, and so on; therefore this paper concentrates on the material factors – such as composition, structure, and surface finish – which should go into the modern piston-ring. The causes of piston-ring wear are analyzed and classified under three headings – abrasion, corrosion, and erosion.

Various types of coating materials, both metallic and non-metallic, employed to reduce the severity of scuffing or scoring, are considered. Test results are revealed that indicate that superficial coatings reduce piston-ring wear from scuffing and erosion, and that a very thin coating of tin was more effective than other types of metallic and non-metallic coatings.

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